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

THE MASTER OF ACCOUNTANCY PROGRAM

The objective of the M.Acc. program is to provide persons who have a high level of ability and motivation with the depth and understanding of accounting that 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, industry, and government.

The M.Acc. degree program is a full-time, weekday program. The nature of the program precludes students from simultaneously working full-time outside of classes. UT's accounting undergraduate and graduate programs are accredited by the American Assembly of Collegiate Schools of Business and are among the initial programs in the nation to receive this accreditation.

Admission Requirements
Application deadlines for international students are considered as space allows. The program is designed both for students who have completed an accredited baccalaureate degree program with a major in Accounting and others. Those with outstanding undergraduate and graduate records in areas other than accounting may earn the M.Acc. degree by completing prerequisites in other business and related disciplines to supplement the applicant's educational background. Students entering the program should be computer literate and are expected to have completed coursework in principles of accounting and introductory economics.

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

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

Course Requirements
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.

Program requirements are:

- Business Core (9-12 hours*):

- Accounting Concentration (12 hours):
  - Three concentrations are available:
    - Assurance Services: 507, 514, 518, 519, 521, 531, 541.
    - Systems: 514, 519, 521, 541, 542, 549.
    - Taxation: 507, 531, 532, 533, 534, 539.
  - Students must take at least four courses from the same concentration including either 519 or 539.

- Accounting Electives (6-9 hours*):
  - Elective courses to be taken from graduate accounting courses.

Students who do not have an undergraduate Accounting degree must complete the following prerequisites: 311, 341, 411, 414, and 431 and include 521 in their graduate program. All prerequisites must be

THE MASTER OF ACCOUNTANCY PROGRAM

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

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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.

Program requirements are:

- Business Core (9-12 hours*):

- Accounting Concentration (12 hours):
  - Three concentrations are available:
    - Assurance Services: 507, 514, 518, 519, 521, 531, 541.
    - Systems: 514, 519, 521, 541, 542, 549.
    - Taxation: 507, 531, 532, 533, 534, 539.
  - Students must take at least four courses from the same concentration including either 519 or 539.

- Accounting Electives (6-9 hours*):
  - Elective courses to be taken from graduate accounting courses.

Students who do not have an undergraduate Accounting degree must complete the following prerequisites: 311, 341, 411, 414, and 431 and include 521 in their graduate program. All prerequisites must be
completed prior to the start of the graduate program.

*As approved by the Director of the Master of Accountancy Program.

Transfer Credits
A maximum of six semester hours taken at other AACSB accredited institutions that otherwise conform to the transfer policy of the Graduate Council 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 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 Seminar in Business Risk and Assurance Methodology and 539 Multi-Jurisdictional Tax Planning and Policy.

BUSINESS ADMINISTRATION CONCENTRATION

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 to be approved by Ph.D. accounting program advisor.

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.Acc. program in Accounting is available to residents of the state of West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

Accounting

GRADUATE COURSES

415 Governmental and Nonprofit Accounting (3)
Advanced study of governmental and nonprofit entities. Governmental accounting principles, revenues and expenditures, budgeting, and financial reporting. Accounting principles and reporting models of nonprofit organizations. Integration of economic and social issues with reporting standards for governmental and nonprofit organizations. Prereq: Financial Reporting by Business and Nonprofit Organizations or consent of instructor.

451 Operational Auditing and Consulting (3)
Approaches to evaluate an entity’s efficiency and effectiveness in various settings and techniques used in consulting to provide entity competitive advantage.

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

506-07 Professional Accounting Practice I, II (3, 3)
Various advanced financial reporting and auditing topics to meet complex and changing needs of profession. Prereq: Admission to M.Acc. program.

514 Risk Management in Networked Business Environments (3)
Security-, integrity-, and cost-management-oriented risks and control measures for various different business system platforms and applications: centralized mainframe environments, distributed client/server environments, intranets/ extranets, electronic commerce, and ERP systems. Prereq: Admission to M.Acc. program or information management concentration, or consent of instructor. (Same as Information Management 511.)

516 Professional Standards (3)
Basic standards and contemporary issues relevant to assurance providers. Actual practice cases to illustrate application. Prereq: Admission to graduate programs or consent of instructor.

517 Seminar in Business Risk and Assurance Methodology (3)
Business risk and emerging methodology used by assurance providers. Prereq: Admission to graduate programs or consent of instructor.

521 Seminar in Advanced Managerial Cost Accounting (3)
Analysis of conceptual and current issues impacting on development and practice of managerial and cost accounting. Approaches to manage ment 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.

531 Tax Research Strategy, and Entity Taxation (3)

532 Corporate Taxation and Reorganizations (3)
Organization and structure, distributions, liquidations, reorganizations, and special problems in taxation of corporations and shareholders. Prereq: Admission to M.Acc. program or consent of instructor. Prereq or coreq: 531.

533 Taxation of Partnerships and S Corporations (3)
Formation, operation, termination, and other special problems of partnerships. Election for S Corporations, and comparison of partnerships and S Corporations. Prereq: Admission to M.Acc. program or consent of instructor. Prereq or coreq: 531.

534 Family Tax Planning (3)
Review and analysis of laws pertaining to inter vivos and post-mortem property transfers and taxation of estates. Financial planning techniques and strategies used to accomplish family tax planning objectives. Prereq or coreq: 531.

539 Multi-Jurisdictional Tax Planning and Policy (3)
Analysis of international, state and local tax law as it pertains to business transactions. Identification of tax planning opportunities and design of strategies to accomplish tax planning objectives. Policy issues related to multi-jurisdictional taxation. Prereq or coreq: 531.

541 Database Systems (3)
Design, implementation, and use of database systems for collection, organization, and distribution of economic information about organizations. Prereq: Accounting Information Systems I to a graduate program or consent of instructor.

542 Electronic Commerce (3)
Essential technological, strategic, and information security issues for conducting business-to-business and business-to-consumer electronic commerce. Effects of internet on business and society. Prereq: 541 or Business Administration 506, or consent of instructor. (Same as Information Management 512.)

549 Systems Issues and Policies (3)
Seminar in emerging topics in management systems and knowledge-based systems. Prereq: 541 and admission to a graduate program or consent of instructor. Prereq or coreq: 542.

92 Graduate Internship in Accounting (3)
Full-time professional employment for one academic semester involving qualified job experience, written report of responsibilities, and evaluation of student performance. Prereq: Admission to M.Acc. program or consent of M.Acc. advisor.

93 Individual Research in Accounting (3)
Directed research in topic of mutual interest. Prereq: Admission to M.Acc. program or consent of M.Acc. advisor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) Preregistration required.

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

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

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

693 Independent Study (3)
Directed research in topic of mutual interest. Prereq: Admission to doctoral program with concentration in accounting. May be repeated. Maximum 6 hrs.

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 (College of Communications))

MAJOR

DEGREES

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

Ronald E. Taylor, Head
THE DEPARTMENT OF ADVERTISING OFFERS A CONCENTRATION AREA FOR THE MASTER'S DEGREE WITH A MAJOR IN COMMUNICATIONS AND AGRICULTURAL EXTENSION EDUCATION. CANDIDATES FOR THE MASTER'S DEGREE MUST MEET THE GENERAL REQUIREMENTS OF THE GRADUATE COUNCIL AND THOSE STIPULATED BY THE DEPARTMENT.

THE MASTER'S PROGRAM

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 either research methodology or statistics.
5. A final oral examination.

Non-Thesis Option

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

GRADUATE COURSES

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

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

520 Advertising and Communications Theory (3) Application of contemporary communications theories of attitude change, information-processing, and persuasion as applied to creative strategy decisions. Prereq: Consent of instructor or admission to program. Sp

530 Advertising Research (3) Nature, scope, and applications of research function to advertising decisions. Market segmentation, copy appeals, media strategy. Prereq: Statistics 201 Introduction to Statistics or equivalent. Sp

540 Advertising Planning (3) Analysis of decision-making in budgeting, creative strategy, media strategy, research, evaluation, and agency-client relationships. Advertising response functions. Prereq: Consent of instructor or admission to program. Sp

597 Independent Study (3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. E

Aerospace Engineering

See Mechanical and Aerospace Engineering

Agricultural and Extension Education

(College of Agricultural Sciences and Natural Resources)

MAJOR

DEGREE

Agricultural and Extension Education M.S.

Richard Poling, Interim Head

Professors:

Lessly, Roy R. (Emeritus), Ed.D. ................... Oklahoma State Poling, Richard L., Ph.D. ........................ Ohio State

Tod, John D. (Emeritus), Ed.D. ............... Illinois Waters, Randol G. (Liaison), 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 curriculum 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 Council and those stipulated by the department.

GRADUATE COURSES

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

501 Creative Component in Lieu of Thesis (3) Capstone experience completed under supervision of major professor and committee. Individual project: literature survey; development of teaching software; development of curricular materials: development of white paper; or another suitable project. Prereq: Consent of major professor. Non-thesis majors only. S/NC only. E

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

511 Extension History, Philosophy and Objectives (3) Historical and philosophical foundation of adult education in American agriculture, key figures, issues of legislative movement, farmer organizations and programs. Cooperative Extension Service, origin, legislation and goals and nature of present objectives and programs. Prereq: 211 Foundations of Agricultural and Extension Education or consent of instructor. Sp

521 Extension Program Planning and Evaluation (3) Theories and models of program development and evaluation; planning and conducting needs assessments; planning, organizing, implementing and evaluating extension education programs; development and interaction of county, state and federal extension plans of work; and principles, techniques and instruments used to identify, gather and analyze information to design extension programs. Prereq: 211 Foundations of Agricultural and Extension Education, 511, or consent of instructor. Sp

522 Educational Technology in Agricultural and Extension Education (3) Advanced concepts and methods relevant to both formal and non-formal instructional methodologies. Processes by which professional change agents influence the introduction, adoption, and diffusion of technological change. Prereq: 435, 436 Student Teaching in Agricultural and Extension Education or consent of instructor. F

524 Research Methodology (3) Social science research methods related to research in agricultural and extension education; issues; research design, reliability and validity in measurement, sampling procedures, logic of analysis, scaling and measurement, and selection and interpretation of appropriate inferential tests of significance. Prereq: 436 Student Teaching in Agricultural and Extension Education, 511 or consent of instructor.

525 Curriculum Development in Agricultural and Extension Education (3) Methods and procedures for developing curricula in agricultural and extension educational programs and scheduling learning activities used to implement these planned programs. Prereq: 435, 436 Student Teaching in Agricultural and Extension Education, or consent of instructor.

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

527 Adult Education Strategies in Agricultural and Extension Education (3) Methods of developing and implementing educational programs for adults in agricultural and extension education and related contexts: adult learning theories and children and youth pedagogy; understanding and determining adult needs, priorities and motivation for participating in educational programs; adoption of new ideas by adult learners; methods and materials effective in teaching adults; developing favorable attitudes toward post-secondary education and life-long learning. Prereq: 211 Foundations of Agricultural and Extension Education, 511 or 346 Instructional Strategies for Teaching Agricultural Education or consent of instructor. Sp

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

532 Managing Organizations, Programs and Personnel (3) Theory and principles of management for individual and organizational effectiveness of agricultural organizations. Prereq: 511, 521, or consent of instructor. Sp

533 Agricultural Leadership Development (3) Identification of styles and roles of leadership; development of leadership techniques and skills required in working with organizations and youth groups, methods of resolving conflict, of communicating, of guiding and evaluating; ethical considerations for leaders. Prereq:
Agricultural Economics

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREES

Agricultural Economics

M.S.

D. L. McLemore, Head

Professors:
Badenhop, M. B. (Emeritus), Ph.D. .......... Purdue
Brooker, J. R. (Liaison), Ph.D. .......... Florida
Cleland, C. L. (Emeritus), Ph.D. .......... Wisconsin
Cross, T. L., Ph.D. ................ Oregon State
Eastwood, D. B., Ph.D. ................ Tufts
English, B. C., Ph.D. ................ Iowa State
Garland, C. D., Ph.D. ............... Tennessee
Gerloff, D. G., Ph.D. ................ Texas A&M
Hall, Charles R., Ph.D. ............... Mississippi State
Jensen, K. L., Ph.D. ................. Oklahoma State
Keller, L. H. (Emeritus), Ph.D. .......... Kentucky
Klintd, T. H., Ph.D. ................. Kentucky
Leuthold, F. O. (Emeritus), Ph.D. .......... Wisconsin
McLemore, D. L., Ph.D. ............ Clemson
McManus, B. R. (Emeritus), Ph.D. .......... Purdue
Martin, J. A. (Emeritus), Ph.D. .......... Minnesota
Mundy, S. D. (Emeritus), Ph.D. .......... Tennessee
Orr, R. H., Ph.D. ................ Illinois
Park, W. M., Ph.D. ................ Virginia Tech
Pentecost, B. H. (Emeritus), J.D. .... Tennessee
Rawls, E. L., Ph.D. .............. Virginia Tech
Ray, D. E. (Blassingame Chair of Excellence), Ph.D. .......... Iowa State
Riley, J. B., Ph.D. ................ Oklahoma State
Roberts, R. K., Ph.D. ............ Iowa State
Smith, G. F., Ph.D. ............ Tennessee
Whatley, T. J. (Emeritus), Ph.D. .......... Purdue

Associate Professors:
Barefield, D. A., Ph.D. ............... Texas A&M
Larson, J. A., Ph.D. .............. Oklahoma State
Yen, Steven T., Ph.D. ............... Minnesota

Assistant Professors:
Bazen, Ernest F., Ph.D. ........... Kentucky
Clark, Christopher D., Ph.D. ........ Vanderbilt
De La Torre Ugarte, D. G., Ph.D. .......... Oklahoma State

Tiller, K. H., Ph.D. .......... Tennessee

The Department of Agricultural Economics offers a program of graduate study leading to the M.S. degree. The M.S. program may be completed under a thesis option with a concentration in agricultural economics or agribusiness. For specific information, contact the department head.

THE MASTER’S PROGRAM

A candidate for the master’s degree must complete a minimum of 30 hours of graduate credit in courses approved by the student’s master’s committee. At least 27 hours of graduate credit must be earned in courses numbered at or above the 500 level.

Agricultural Economics

The thesis option in agricultural economics is designed to prepare students for analytical and research careers in the public and private sectors, and to prepare students interested in entering a Ph.D. program. In the thesis option, 15 hours of agricultural economics, 6 hours of economic theory, 6 hours of quantitative methods, and 6 hours of thesis are required. Each student must pass a final oral examination.

In the non-thesis option, 24 hours in agricultural economics, 6 hours of economic theory, and 6 hours of quantitative methods are required. Each student must pass both written and oral comprehensive exams.

Agribusiness

The agribusiness concentration is designed to prepare students to succeed in the public or private sectors of agriculture, including product manufacturing and marketing, natural resource management, farm management, and financial analysis. Fifteen hours of agricultural economics, 3 hours of economic theory, 6 hours of quantitative methods, and 6 hours of thesis are required. Each student must pass both written and oral comprehensive examinations.

MINOR

A minor will include 6 hours of course-work in the department, with at least 3 hours in 500-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.

MINOR IN ENVIRONMENTAL POLICY

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

Agricultural Economics

GRADUATE COURSES

412 Agricultural Finance (3) Macro-finance, financial objectives, acquisition of debt and equity funds, capital investments, capital allocation, credit analysis, borrower and lender loan application analysis, insurance strategies, computer applications, kinds and sources of agricultural credit, and farm loan intermediation. Prereq: 212 The Agribusiness Firm and Economics 201 Introductory Economics. F

420 International Agricultural Trade and Marketing (3) Real and monetary aspects of international trade and marketing, effect of the agricultural commodity policy on the agricultural sector, 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. Sp

430 Agricultural Policy (3) Values, goals and policy process. Economic rationale and effects of policy. Historical development and current characteristics of commodity, credit, food, and trade policy. Prereq: Intermediate Agricultural Economics or consent of instructor. F

442 Agribusiness Management (3) Applications of advanced decision analysis concepts and tools to analyze management decision problems in farm and nonfarm agribusiness settings. Case study work on strategic planning; assessing cost structure using budgeting and break-even analysis; evaluating profitability, liquidity, and solvency using financial statements; analyzing investments using capital budgeting. Prereq: Farm Business Management or consent of instructor. F

450 Agricultural Industry Analysis and Forecasting (3) Analytical tools for decision making in agricultural sector; analysis of commodity supply and demand conditions; economic modeling; market forecasting; analysis of temporal and spatial patterns. Prereq: Agricultural Microeconomics and Introduction to Statistics or consent of instructor. F

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

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

502 Registration for Use of Facilities (1-15) 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 product and factor markets; efficiency and welfare. Prereq: Calculus and Intermediate Microeconomics or equivalent. 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: Regression and Correlation Methods or consent of instructor. F

525 Agribusiness Operations Research Methods (3) Applications of operations research methods and concepts for agribusiness. Theoretical background and applied considerations of each technique with emphasis on applications. Computer and other applications of each technique for relevant agribusiness problems. Prereq: Basic Calculus and 524. Sp

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. F

542 Advanced Agribusiness Production Decisions (3) Theoretical and empirical concepts in agricultural resource allocation; evaluation of both static and dynamic issues; decision theory with application to agricultural firms; aggregate impact of firm decisions on industry. Prereq: 505 or equivalent. Sp

550 Advanced Agribusiness Marketing (3) Use of economic concepts in agribusiness marketing decisions. Analysis of agricultural markets; buyer behavior in food and fiber markets; competitive environment. Profitability analysis of marketing and distribution decisions; market planning and strategy; product
evaluation and new product introduction; pricing decisions. Prereq: 505, Regression and Correlation Methods or equivalent. Sp

570 Advanced Natural Resource Economics (3)
Analysis of natural resource allocation issues; applied welfare economics, external effects and evaluation of public policy. Prereq: 470 and Economics 511 or consent of instructor. F

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

595 Professional Internship (6)
Supervised internships with appropriate agribusiness firms.

Rural Sociology

GRADUATE COURSES

480 Technological and Community Change (3)
Analysis of communication processes whereby new technology spreads within a farm population and analysis of social institutions related to change in rural communities. Prereq: Rural Sociology or consent of instructor. (Same as Sociology 480.) Sp

580 Advanced Rural Sociology (3)
Application of sociological concepts and theory to analyze changing structure and function of rural life in U.S. and developing countries. Demographic changes, rural social and community indicators, and rural development processes. Prereq: 380 or equivalent. (Same as Sociology 580.) Sp

593 Special Topics in Rural Sociology (1-3)
Current sociological issues involving application of sociological theory. Prereq: 380 or consent of instructor. May be repeated. Maximum 6 hrs. E

Agriculture and Natural Resources

(College of Agricultural Sciences and Natural Resources)

GRADUATE COURSES

507 Professional Development Seminar (1)
Planning and executing graduate research programs; ethics and professionalism; graduate program procedures and resources. (Same as Animal Science 507, Biosystems Engineering 507, Biosystems Engineering Technology 507, Food Science and Technology 507, Ornamental Horticulture and Landscape Design 507, and Plant and Soil Sciences 507.) S/NC only. F

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

Animal Science

(College of 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
Beil, M. C. (Emeritus), Ph.D. .... Oklahoma State
Bletner, J. K. (Emeritus), Ph.D. .... Ohio State
Chamberlain, C. C. (Emeritus), Ph.D. ............... Iowa State
Conatser, G. E., M.S. ................. Kentucky
Erickson, B. H. (Emeritus), Ph.D.Kansas State
Gill, W. W., Ph.D. ...................... Kentucky
Goan, H. C., Ph.D. ...................... Michigan State
Godkin, J. D., Ph.D. ....................... Massachusetts
Hall, O. G. (Emeritus), Ph.D. ......... Iowa State
Kattes, H. G., Ph.D. ................. VPI
Kirkpatrick, F. D., Ph.D. .......... Tennessee
Lane, C. D., Ph.D. ....................... Tennessee
Lidvall, E. R. (Emeritus), M.S. ......... Tennessee
Masincup, F. B. (Emeritus), Ph.D. ......... Wisconsin
Murphree, R. L. (Emeritus), Ph.D. .... Wisconsin
Neel, James B., Ph.D. ............... Tennessee
Oliver, S. P., Ph.D. ..................... Ohio State
Richardson, D. O. (Emeritus), Ph.D.Ohio State
Robbins, K. R., Ph.D. ................. Illinois
Rogers, Gary W., Ph.D. .............. NC State
Saxton, A., Ph.D. ....................... NC State
Shirley, H. V. (Emeritus), Ph.D. ......... Illinois
Tugwell, R. L. (Emeritus), Ph.D. ......... Kansas State

Associate Professors:
Grizzle, J. M., Ph.D. .................. Florida
Harper, F., Ph.D. ...................... Rutgers
Heitmann, R. N., Ph.D. ............... Maine
Mathew, A. G. (Liaison), Ph.D. ....... Purdue
Schrick, F. N., Ph.D. ................... Clemson
Smith, M. O., Ph.D. ................. Oklahoma State
Stalder, Kenneth J., Ph.D. ............ Iowa State
Waller, J. C., Ph.D. ...................... Nebraska

Assistant Professors:
Edwards, J. L., Ph.D. ................. Florida
Pighetti, G., Ph.D. ..................... Penn State
Richards, C. J., Ph.D. ................. Kentucky

The Department of Animal Science offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Animal Science. At the M.S. level, areas of concentration are animal genetics, animal health and well-being, animal management, animal nutrition, and animal physiology with orientation towards beef cattle, dairy cattle, swine, and poultry. The Ph.D. program offers areas of emphasis in animal genetics, animal health and well-being, animal nutrition, and animal physiology. For specific information, contact the department head.

It is recommended that all first-year graduate students enroll in 507 and 509. All first- and second-year students are required to enroll in 596 each fall and each spring term.

THE MASTER’S PROGRAM

For admission to the M.S. program, a student must have obtained a 3.0 grade-point average on a 4.0 scale (or a 3.0 each term during the junior and senior years) in a completed undergraduate degree program in one of the animal sciences or in a related area. The student must submit evidence (letters of recommendation, personal interview, etc.) that indicates ability to complete requirements for the M.S. Prerequisite courses may be required if the student has insufficient undergraduate background. If the student has an unsatisfactory grade-point average, acceptance may be on a probationary (non-degree) basis and a minimum of 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 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 program 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, exclusive of doctoral research and dissertation, of which a minimum of 6 hours must be at the 600 level. Students in the nutrition, breeding, physiology, or anatomy concentration must complete at least 12 hours at the 500 and 600 level in the respective concentration or closely related area. Students in the management concentration must complete 12 hours at the 500 of 600 level in two non-management concentrations.
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 ova, spermatozoa and embryos; application of methods of natural breeding and techniques of artificial insemination and embryo transfer; herd sire and dam evaluation; pregnancy determination; gestation and parturition; infertility; recent advances in theriogenology. Prereq: 320 or equivalent. 1 hr and 2 labs. F

430 Nutrient Evaluation and Ration Formulation (3) Ration nutrient analysis and formulation for beef and dairy cattle, sheep, horses, swine, poultry, laboratory, zoo, and companion animals. Mathematical and computer solutions and applications to formulating complex rations with constraints. Prereq: 330 Comparative Animal Nutrition or equivalent and introductory computer science course. 2 hrs and 1 lab. Sp

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 response and economic returns. Comparisons made to small ruminant, forage-based production systems. Prereq: Completion of Animal Science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. Sp

482 Dairy Cattle Production and Management (3) Integration of principles of nutrition, 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 response 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 response and economic returns. Prereq: Completion of 300-level core courses or equivalent or consent of instructor. 2 hrs and 1 lab. F

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

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

507 Professional Development Seminar (1) (Same as Agriculture and Natural Resources 507, Biosystems Engineering 507, Biosystems Engineering Technology 507, Food Science and Technology 507, Ornamental Horticulture and Landscape Design 507, and Plant and Soil Science 507.) S/NC only. F

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

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

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

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; interrelationships, availability and deficiencies of nutrients. Prereq: Animal Nutrition, Feeds, and Ration Formulation or consent of instructor. F

535 Ruminology (2) Anatomy, physiology, and microbiology of rumen ecosystem: microbial fermentation and metabolism of polysaccharides, lipids and nitrogen. Prereq: 530 or consent of instructor. Sp

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

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

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 for micro- or mainframe computer. (Same as Plant and Soil Sciences 571.) Sp

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

596 Seminar (1) Advanced topics in animal science. Required of all first- and second-year MS students. May be repeated. Maximum 2 hrs. Sp

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

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

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

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 and Cellular and Molecular Biology 410 or Nutrition 511 or consent of instructor. Sp, A

651 Advanced Topics in Animal Anatomy (1-4) Current and future research methodology, laboratory situation, recent advances in quantitative techniques for gross and microscopic examination. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. (Same as Comparative and Experimental Medicine—Veterinary Medicine 651.) E

652 Disorders of the Endocrine System (2) Pathological and physiological aspects of diseases; endocrine glands of various animal species. Prereq: 521 or consent of instructor. (Same as Comparative and Experimental Medicine—Veterinary Medicine 652.) Sp, A

681 Advanced Topics in Animal Health and Welfare (1-4) Recent advances and concepts, research techniques, and current problems associated with animal health and behavior. May be repeated. Maximum 6 hrs.

696 Seminar (1) Advanced topics in animal science. Required of all first- and second-year Ph.D. students. May be repeated. Maximum 2 hrs. Sp

Animal Science-Veterinary Medicine

See College of Veterinary Medicine and Comparative and Experimental Medicine.

Anthropology

(College of Arts and Sciences)

MAJOR DEGREES

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

Andrew Kramer, Head

Professors:

Bass, William M. (Emeritus), Ph.D. ........................................ Pennsylvania

Paulkner, Charles H., Ph.D. .................... Indiana

Harrison, Faye V., Ph.D. .................... Stanford

Howell, Benita J., Ph.D. .................... Kentucky

Jantz, Richard L., Ph.D. .................... Kansas

Klippel, Walter E., Ph.D. .................... Missouri

Königsberg, Lyle, Ph.D. .................... Northwestern

Logan, Michael H., Ph.D. .................... Penn State

Parmalee, Paul W. (Emeritus), Ph.D. .................... Texas A&M

Schoedel, Gerald F., Ph.D. .................... Washington State

Simek, Jan F., Ph.D. .................... SUNY Binghamton

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

Associate Professors:

Kramer, Andrew (Liaison), Ph.D. ............... Michigan

Marks, Murray K., Ph.D. .................... Tennessee

Assistant Professors:

Ferreira, Mariana, Ph.D. .................... California

Qirko, Hector N., Ph.D. .................... Tennessee

Research Associate Professor:

Chapman, J., Ph.D. .................... North Carolina

Research Assistant Professors:

Elam, J. Michael, Ph.D. .................... Missouri

Frankenberg, S. (Curator), Ph.D. .................... Northwestern

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

THE MASTER'S PROGRAM

Students wishing to enter the Master of Arts degree program with a major in Anthropology should have an undergraduate GPA of 3.5 in the major, 3.3 overall, and hold a bachelor's degree from an accredited university with a major in Anthropology. Applicants with a major in a related field (biology, sociology, geology, classics or geography) will be considered only if they have a formal minor in anthropology or its equivalent (at least five upper division anthropology courses).
All prospective M.A. students must make formal application to The University of Tennessee Graduate Admissions. Copies of the application form, transcripts, and GRE scores that are sent to Graduate Admissions should also be sent directly to the Department of Anthropology at the same time. In addition, the department requires a letter of intent from the applicant indicating career goals and reasons for selecting the University of Tennessee, three letters of recommendation, and one sample of the prospective student’s written work (a class paper or research report). These materials should be sent directly to the Graduate Secretary, Department of Anthropology, SSH 250, University of Tennessee, Knoxville, TN 37996-0720.

Graduate applications are considered once a year by the Graduate Committee. All application materials must be received in the department by January 15 for admission the following Fall. Because of the structure of first-year studies, M.A. students should plan to begin their studies in the Fall semester.

M.A. Requirements

The program leading to the M.A. is a general curriculum that allows for concentration after completion of a core course sequence. Formal requirements include:

1. Selection of an M.A. advisor. This should be done as soon as possible in the student’s program but must be done no later than the end of the first semester in residence. The department graduate secretary must be informed in writing of each student’s advisor.

2. A minimum of 30 credit hours in graduate courses. Twenty-four hours must be in coursework graded A-F. Coursework must include three core classes taken in the first year:
   a. 510 Method and Theory in Cultural Anthropology
   b. 560 Theory in Archaeology
   c. 590 Method and Theory in Biological Anthropology

Additional coursework should be selected in consultation with the student’s advisor and must include one additional course from two anthropology concentrations beside the student’s primary concentration. At least 20 hours of coursework must be at the 500 level or higher.

3. During the first year, comprehensive Graduate Evaluation Examinations (GEEs) are required of all M.A. students and are based on the content of the core courses. These examinations are given during regularly-scheduled final periods in each core class and are graded by all faculty within the appropriate subdiscipline for each course. At the end of the first year, all M.A. students will be evaluated by the entire faculty and will either be retained or dropped from the program based on their first year’s performance and GEE scores.

4. All M.A. students must attend the guest or class seminar of the visiting lecturer program. To insure compliance with this requirement, each student is required to register for one credit hour of Anthropology 550 in the fall semester of each year and fulfill all requirements for the course as defined by the instructor. Materials covered by visiting lecturers may appear on the GEE.

5. A graduate-level introductory statistics course, usually Statistics 537.

6. In the second year of the program, students pursue their concentration area and undertake thesis research. Coursework will be determined through consultation with the student’s advisor and committee (composed of the student’s advisor and at least one other member of the Anthropology faculty along with other mutually-agreed-upon members).

7. Successful completion of the thesis and final oral examination. Normally, students will complete and defend their theses during the fall semester of the second year.

8. Two copies of the thesis are required by the Office of Graduate Student Services. In addition, bound copies of the thesis are to be provided to the department and to all members of the student’s M.A. committee. In addition to the requirements listed above, M.A. students have the option of completing a minor in statistics. The statistics minor requires 9 hours of coursework, normally Statistics 537 and 538 plus one additional course from an approved list.

THE DOCTORAL PROGRAM

In addition to the Graduate Council requirements, requirements for the Ph.D. degree with a major in Anthropology, in the appropriate sequence of completion, are as follows:

Admission: Admission to the Ph.D. program is contingent upon completion of all requirements prior to that level. Master’s thesis candidates at UT, who are conditionally accepted into the Ph.D. program can enroll as doctoral students the semester following their M.A. degree. Students holding Master’s degrees from other institutions must apply by January 15 for admission the following Fall and must begin their studies in the Fall semester.

Admission to the Ph.D. program is based upon the applicant’s academic record and credentials, but also on fit between an individual’s interest and faculty areas of research. Applicants will not be admitted to the Ph.D. program unless appropriate faculty members are available to chair and serve on the doctoral committee. Doctoral program applicants should communicate directly with the potential chairperson and two additional members of the anthropology faculty who will be asked to serve on the committee.

Applicants to the Ph.D. degree program should meet the same academic standards as M.A. program applicants and furnish the same materials (see The Master’s Program).

Admission to the program requires either:

1. Acceptance of a Master’s degree in anthropology; or
2. Acceptance of a Master’s degree in another discipline, with the provision that the student will follow the first-year program with entering M.A. students, i.e., complete the core courses (510, 560, 590) and pass the Graduate Evaluation Examinations.

Doctoral Committee: A doctoral committee is appointed following admission to the program. In consultation with this committee, the student defines the future program of studies. When the student and committee have reached the specific fields of specialized competence over which the student will be examined, a brief delineation of the fields by the student, approved by the members of the committee, is presented to the department head and the student’s major professor. As early as possible, but no later than a full semester after admission to candidacy, the student shall formally present a written dissertation proposal to the department head and advisor.

Residence and coursework requirements are designed to ensure that the potential Ph.D. candidate must complete two consecutive semesters of full-time residence prior to taking the doctoral comprehensive examination. The student must complete the minimum coursework requirements of the Graduate Council, including at least nine hours of 500- or 600-level courses outside of anthropology, chosen in consultation with the doctoral committee, particularly the outside member who represents the cognate area. Outside coursework may be taken in a single discipline or be distributed across two or more disciplines as appropriate to the individual’s program of study.

Statistics: Demonstration of competence in statistics by completing Statistics 537 and 538 with a grade of B or better is required.

Language: Students must demonstrate 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 either:

1. Successful performance on a language examination administered by the appropriate language department. A student electing this alternative should consult with the advisor; or
2. Completion of the second semester of specialized reading courses for graduate students with a grade of B or better.

The department does not accept completion of the intermediate (200 level) sequence of a language as a formal option for fulfilling the language requirement.

Doctoral Comprehensive Examination: Students must successfully complete a written and oral comprehensive exam.

1. Comprehensive Written Examination: When the Ph.D. aspirant has completed all of the foregoing requirements and is judged by the committee to be prepared in the field(s) of concentration, the candidate is required to take a comprehensive written examination. The exam will consist of three sections and be given by the student’s committee. All three sections must be taken within seven consecutive days.

2. Comprehensive Oral Examination: This examination follows shortly after successful completion of the comprehensive written exam. The major professor acts as chairperson of the committee.

Admission to Candidacy: Upon successful completion of the comprehensive exam and with the formal approval of the Dean of Graduate Studies, the student is admitted to candidacy for the Ph.D. degree. The formal dissertation prospectus must be filed no later than one full semester after advancement to candidacy.

Dissertation Research: This period of research and writing will be under the direct guidance of the candidate’s major professor. The major professor will act as chairperson of the candidate’s committee. The candidate must earn a minimum of 24 hours in Anthropology 690 and maintain continuous registration until the dissertation is accepted.
The option of presenting publishable papers as a dissertation is not a formal option for the Anthropology Department.

Defense of Dissertation Examination: When the dissertation has been tentatively accepted by the committee, a final oral examination will be held. The committee conducts the exam, which is ordinarily held as a colloquium in which the candidate will expound on the nature and significance of his/her contribution to anthropological knowledge as set forth in the dissertation.

ACADEMIC COMMON MARKET

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

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 ethnographic data. Prereq: 130 Cultural Anthropology.

411 Linguistic Anthropology (3) Basic linguistic concepts applied to research in cultural anthropology, investigation of relationships between language and culture. Prereq: 130 Cultural Anthropology or Linguistics 200. (Same as Linguistics 411.)

412 Folklore in Anthropology (3) Introduction to anthropological study of folklore, using folklore and folk material from historic East Tennessee sites used for class projects. Recommended prereq: Historic Archaeology.

413 Dynamics of Culture (3) Major forms of culture change, ranging from spontaneous evolution and diffusion to religious revitalization and political revolt. Continuity and change in diverse cultural settings through use of anthropological, ethnographic, and contemporary case studies. Prereq: 130 Cultural Anthropology or consent of instructor.

414 Political Anthropology (3) Organization and dynamics of power and politics in both stateless and state-level societies. Encapsulation of traditional political forms and systems within modern states. Prereq: 130 Cultural Anthropology or consent of instructor.

416 Applied Anthropology (3) Introduction to principles, practice and ethics of anthropological practice applied to practical problems in non-academic settings. Overview of career opportunities in various domains of applied anthropology. Prereq: 130 Cultural Anthropology or consent of instructor.

419 Ethnographic Research (3) Conceptual and practical exploration of methods and techniques cultural anthropologists use in fieldwork. Prereq: 130 Cultural Anthropology or consent of instructor.

435 Historical Archaeology Laboratory (3) Laboratory procedures for processing, identification, and interpretation of artifacts from historic sites. Artifactual material from historic East Tennessee sites used for class projects. Recommended prereq: Historic 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 analysis, and review of selected case studies. Prereq: 120, 130, 410, or consent of instructor.

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

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

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

465 Urban Anthropology (3) Field study and interpretation of urban remains on historic urban sites in U.S. Lectures and field and laboratory research on urban sites in East Tennessee. Recommended prereq: History of Urban Anthropology.

469 Human Osteology (4) Intensive examination of human skeletal remains. Prereq: 110 or consent of instructor. 3 hrs and 1 lab.

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

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

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


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

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

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

502 Registration for Use of Facilities (1-15) Required for the students not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C 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. May be repeated. Maximum 9 hrs.

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

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

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

517 Forms of Social Inequality (3) Anthropological perspectives on societies stratified along lines of rank, class, ethnicity, and caste; inequalities engendered 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 Zooarchaeology (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 Zooarchaeology (4) Examination and comparison of skeletons of major vertebrate groups, shells of terrestrial and aquatic mollusks, in relation to animal remains from archaeological contexts. Basic osteology and shell characters of species encountered in aboriginal assemblages. Use of comparative collections. May be repeated. Maximum 9 hrs.

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

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

550 Contemporary Issues in Anthropology (1-3) Review of recent directions in method and theory in anthropology. May be repeated. Maximum 6 hours.

560 Theory in Archaeology (3) Detailed consideration of theory in contemporary archaeology: models of scientific explanation, research design, archaeological formation processes, and methods of analysis and interpretation. May be repeated. Maximum 6 hrs.

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

563 Lithic Artifact Analysis (3) Methods for analyzing and dating stone tools in prehistoric and historical periods. An archaeological approach to the study of 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.


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 adaptive unit. Prereq: 480.

585 Laboratory Studies in Biological Anthropology (3) Topical coverage of laboratory methods in biological anthropology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
Architecture (College of Architecture and Design)

MAJOR DEGREE
Architecture .................................................. M.Arch.

Marleen K. Davis, Dean
Max A. Robinson, Director
Jon P. Coddington, Graduate Program Head

Professors:
Conley, G. (Emeritus), B.Arch. .......... Harvard
Davis, Marleen, M.Arch. .............. Harvard
Kaplan, M. (Emeritus), M.Arch. .. Harvard
Kelso, R. M., M.S. .................... Tennessee
Kinzy, S. A., Ph.D. ...................... SUNY (Buffalo)
Lauer, W. J. (Emeritus), M.S.Arch. Engr. .......... Iowa State
Lester, A. J. (Emeritus), M.Arch. ....... Virginia
Lizon, P., Ph.D. ....................... Pennsylvania
Moffett, M. S., Ph.D. ................... MIT
Rabun, J. S., M.A., M.Arch. ............ Texas
Robinson, M. A., M.Arch. ............ Pennsylvania
Rudd, J. W. (Emeritus), M.A. .......... Northwestern
Shell, W. S., M.S.Arch. ............... Columbia
Watson, J. S., M.Arch. .................. Pennsylvania

Associate Professors:
Coddington, J., M.Arch. .............. Pennsylvania
Davis, T. K., M.Arch. .................. Cornell
Debelius, C., M.Arch. ............... Harvard
Drisin, A., MdesS ....................... Harvard
Fox, L. D., M.Arch. .................. Cranbrook
Martella, W. E., B.Arch. ............. California
Moir-McClellan, T. W., M.Arch. ....... Michigan
Schimmenti, M. M., M.Arch. .......... Florida

Assistant Professors:
Attwicker, M., B.Arch. .................. PFI
DeKay, M., M.Arch. ................... Oregon
Dodds, G., Ph.D. ....................... Pennsylvania
French, R. C., M.Arch. ............... Tennessee
Klinkhammer, B., M.Arch. .......... RWTH (Aachen)
Stach, E., IPMA ....................... Bauhaus
Thurlow, A., M.Arch. ................. Columbia
Ware, S. M., M.F.A ...................... Tennessee

MASTER 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. Contact the Graduate Program Head for additional information.

Admission Requirements

In addition to meeting the Graduate Council'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 an accredited college or university 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 an essay and three letters of recommendation. A personal on-site interview is desirable but not mandatory. For those applicants from accredited 4+2 architecture programs, a portfolio is required in addition to the above requirements.

For Track 2 applicants, a Bachelor of Architecture degree from an NAAB accredited program, or foreign equivalent is required. 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 to Architecture to include an essay and three letters of recommendation are also required. A personal on-site interview is desirable but not mandatory.

The general portion of the Graduate Record Examination is required of all applicants. Applicants should take the GRE at least one semester in advance of application for admission.

Degree Requirements

Track 1 requires a minimum of 48 semester hours of undergraduate preparation and 60 semester hours of graduate coursework, taking approximately 3 ½ years of full-time study. A minimum of 4 hours of architectural electives or approved electives from another discipline must be taken at the 500 level or above.

Track 2 requires a minimum of 30 semester hours of graduate coursework. Both tracks require 6 hours of Thesis 500 with a public presentation and oral defense of the thesis. Retention in the program is contingent upon evidence of satisfactory progress toward the degree. Student's progress will be reviewed each semester by the Graduate Program Head. 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 on an in-state tuition basis. The M.Arch. program in Architecture is available to residents of the states of Arkansas, Delaware, Kentucky, Mississippi, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

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

404 Preservation Technology (3) Techniques of preservation: methods of analysis, history of materials and technology used in old buildings. Prereq: 403.


406 Ideas in Architecture (3) Historical and critical review of major ideas of architecture through the ages. Open to all students.

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 field trips. Historical change in urban form and design.

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

413 Tennessee Architecture (3) History of settlement patterns and building in Tennessee. Reading assignments, lectures, discussion, and field trips. Historical research using primary material.

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

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

417 The International Style (3) Survey of architecture of early modern movement, primarily in Europe and America, 1900-1940.

419 American Architecture I (3) Development of American architecture from arrival of immigrants in 1607 until 1860.

420 American Architecture, 1840-1940 (3) Stylistic periods from Gothic Revival through twentieth century.

421 History of Landscape Architecture (3) Intellectual, social, and geographical influences that provide theoretical basis for design throughout history. Selected examples of landscape architecture analyzed in terms of design.
422 Modern Eastern European Architecture (3) Twentieth century architecture in Russia, Czechoslovakia, Poland, Hungary, East Germany, Romania, Bulgaria, Yugoslavia.

425 Special Topics in Architecture (1-6) Faculty initiated course. Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. E

432 Computer Applications in Design II (3) Advanced computer aided design using three-dimensional modeling software. Design analysis using computer animation, rendering techniques, visualization, and video. Prereq: Computer Applications in Design I or consent of instructor. Sp

433 Computer Applications in Design III (3) Integration of three-dimensional modeling and technical analysis using computer to augment building design. Independent studies under faculty direction. Prereq: Consent of instructor. Sp

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

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

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

463 Architectural Development (3) Principles and practice of architect as developer. Impact of economics, finance and urban policy on design and development of real estate. Open to all students.

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

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

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

503 Modern Architecture: Histories and Theories (3) History and theory of modern architecture: late 19th and 20th centuries through broad-based examinations of question of modernity and specific case studies of buildings, periods, and theorems. Prereq: Consent of instructor.

504 Issues in Preservation (3) Architectural issues: preservation, restoration and conservation of historic structures. Prereq: Consent of instructor.

507 Architecture, Culture and Modernity (3) Scope of ideas generated in architecture's recent history to reveal and explain production and reception of architecture: historical background necessary to understand those concepts. Complements history sequence but in specialized field of theory.

509 Seminar in Architectural Technology (3) Architectural aspects influencing building form. Role of technical aspects of structural, environmental and building infrastructure as integrated systems supporting access use and expression of building.

511 Environmental Influences (3) Environmental factors which shape the regional character of architecture. Natural forces associated with these factors, cultural interpretation and response regarding importance and impact.

513 Cultural Aesthetics (3) Principles underlying cultural character of architecture. Role of social, political and economic forces which influence interpretation of factors creating building's character.

514 Seminar in Ethical Imperatives (3) Social, cultural, philosophical and moral issues which impact professional responsibilities. Attitudes, values, and ideas that address formation of profession's ethics.

515 Seminar in Issues in Urban Design (3) Investigations of urban forms, patterns, and attitudes that have shaped towns and cities. Prereq: Consent of instructor.

516 Materials and Methods of Construction (3) Properties of interior and exterior building materials and their relation to construction methods and detailing. Theory of materials selection and application and role and methods and methods play in design process.

521 Principles of Architectural Form (3) Historical and contemporary architectural theory through investigation of literature and related examples. Theories of understanding and theories of application related to generation of architectural form and space in response to both cultural and environmental focus.

525 Special Topics in Architecture (1-3) Student- or instructor-initiated course. May be repeated. Maximum 9 hrs. S/NC or letter grade.

526 Directed Readings in Architecture (3) Readings on topics of interest: primary texts, history, theory, urban issues, technology and professional practice. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

528 Topics in Architectural History and Theory (3) Historic topics, ideas and theories in architecture. Prereq: Consent of instructor.

532 Computer Applications for Architecture (3) Advanced use of computers in architecture. Prereq: Consent of instructor.

551 Research Methods (3) Quantitative and qualitative methods of research in architectural inquiry. Systematic study and application of applied and speculative investigations in field of architectural research. Review and identification of techniques and methodologies and applications for architectural research and scholarship.

553 Advanced Topics in Architectural Technology (3) In-depth investigations and analysis: architectural technology lighting, structure, enclosure, mechanical and other architectural technologies. Prereq: Consent of instructor.

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 basic management functions within professional firms; legal and ethical concerns facing practitioners today; and introduction to special obligations and privileges of design professional.


591 Foreign Study (1-9)

592 Off-Campus Study (1-9)

593 Independent Study (1-9)
4. A portfolio to be evaluated by the faculty. Further information is available by writing to the School 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 graduate level academic (non-studio) courses of which at least 6 hours are to be in art history.
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.

Four semesters (normally the first 40 hours) beyond the Bachelor's 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 School of Art as (1) a minimum enrollment of 6 hours per semester and (2) use of School of Art facilities so that students are available for discussion and criticism.

The candidate's committee will consist of a minimum of 3 members and a maximum of 6 members and will be appointed prior to registration for 599. The committee must consist of one faculty member from the candidate's concentration area (designated as chairperson) and a faculty member from outside the concentration area. The inclusion of an Art History faculty member on each committee is encouraged.

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 coursework, the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis.
3. If, in a review by the student's major area faculty, the student's progress is deemed insufficient, the faculty may recommend a work period without advancement toward the degree, probation with specific goals set for a specific time, or dismissal.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.F.A. program in Art is available to residents of the states of Kentucky or South Carolina (concentration in graphic design only). Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in Art History may be arranged during the student's first semester of study with the consent of the student's area instructors and the Art History faculty. Students must complete a minimum of 12 hours in Art History that is agreed upon by the Art History faculty after review of previous undergraduate coursework. A reading knowledge of French, German, or Italian is a prerequisite, unless waived by the Art History faculty. Graduate Council policy stipulates that a member from the minor unit must serve on the thesis committee.

Art

GRADUATE COURSES

481 MUSEOLOGY I: MUSEUMS, PURPOSE AND FUNCTION (3) Development of museums of art, history, natural and applied science. (Same as Anthropology 481.)

482 MUSEOLOGY II: EXHIBITION PLANNING AND INSTALLATION (3) Exhibition concept development and implementation. Exhibition design and installation techniques. Publicity, production, matting and framing, shipping and storage. Prereq: 481 or consent of instructor. (Same as Anthropology 482.)

484 MUSEOLOGY III: FIELD PROJECTS (1-12) Special field projects: restoration, preservation, registration, and related research on art objects. Prereq: 481 and 482, and consent of instructor. May be repeated. Maximum 12 hrs. (Same as Anthropology 484.)

499 SPECIAL TOPICS (3) Student- or instructor-initiated course offered at the discretion of department. May be repeated. Maximum 12 hrs.

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

507 PROFESSIONAL PRACTICES: TEACHING INSTRUCTION (1) Individual study in development of skills and methodology in teaching studio courses. For students who are not G.T. As. Prereq: Consent of instructor. May not be used toward degree requirements. May be repeated. S/NC only.

591 FOREIGN STUDY (1-15) See College of Arts and Sciences.

592 OFF-CAMPUS STUDY (1-15) See College of Arts and Sciences.

593 INDEPENDENT STUDY (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 VISITING ARTIST SEMINAR (2) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 8 hrs.

Art Ceramics

GRADUATE COURSES


424 Ceramics: Clays and Glazes (3) Clay chemistry, clay bodies, glaze theory and calculation. Formulating, mixing and testing of clay bodies and glaze formulas. Prereq: Ceramics: Portfolio Review.

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

521 Graduate Ceramics I (2-5) May be repeated. Maximum 10 hrs.

525 Graduate Ceramics II (2-5) May be repeated. Maximum 10 hrs.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

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

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

Art Design/Graphic

GRADUATE COURSES

405 Computer Enhanced Graphic Design (3) Exploration of new technologies and their significance to graphic design. Prereq: Intermediate Graphic Design I. Graphic Design Production with a grade of C or better, and Consent of instructor. May be repeated. Maximum 6 hrs.

451 Advanced Graphic Design (3) Theory and techniques of visual problem-solving as applied to advanced applications of graphic design. Prereq: Intermediate Graphic Design II with a grade of C or better.

452 Graphic Design Seminar (3) Discussion of design and professional issues; politics, economics, and ethics for graphic designer. Culminates in student-initiated project. Prereq: 451 with a grade of C or better.

453 Advertising Illustration (3) Media and techniques as applied to advertising illustration. Prereq: Black and White Illustration and successful completion of any portfolio review.

454 Editorial Illustration (3) Media and techniques as applied to editorial illustration for books, magazines, and newspapers. Prereq: Black and White Illustration and consent of instructor. May be repeated. Maximum 12 hrs.

459 Special Topics in Graphic Design (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

550 Studies in Graphic Design/Illustration History (3) Design and Illustration ca. 1850 to present. Prereq: M.F.A. candidate or consent of instructor. May be repeated. Maximum 6 hrs.

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

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

553 Computer Enhanced Design (2-6) Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

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

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

GRADUATE COURSES

419 Special Topics in Drawing and Painting (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

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

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

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

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

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

Art History

GRADUATE COURSES

403 History of Photography (3) Survey of history of photography from introduction of daguerreotype and calotype to most recent trends. Aesthetics and use of photography as medium for artistic expression.

411 Art of South and Southeast Asia (3) Survey of art and architecture of Indian subcontinent and South-East Asia from 2000 B.C. to 20th century. Major achievements of each period in religious, political, and social contexts.

415 Art of China (3) Survey of art and architecture of China from neolithic period to 20th century. Major achievements of each period in religious, political, and social contexts.

419 Art of Japan (3) Survey of art and architecture of Japan from neolithic period to 20th century. Major achievements of each period in religious, political, and social contexts.

425 Early Christian and Byzantine Art to 1350 (3) Art in Italy and the Eastern Empire from the beginnings of Christian art to c. 1350. Mosaic and painting, sculpture and architecture. Writing-emphasis course. (Same as Judaic Studies 425.)

431 Medieval Art of the West, 800-1400 (3) Western European art of the “Dark Ages.” Romanesque, and Gothic periods. Writing-emphasis course. (Same as Judaic Studies 431.)

441 Northern European Painting, 1530-1600 (3) From courtly art of late Middle Ages to Northern Renaissance. Jan van Eyck, Roger van der Weyden, and Durer; early printmakers. Writing-emphasis course.

442 Art of Northern Europe, 1600-1675 (3) Concentrated study of Bruegel, Rubens, Rembrandt, Georges de la Tour, Vermeer, Poussin, and Hals. Writing-emphasis course.


461 Art of Southern and Eastern Africa (3) Art traditions of eastern and southern regions of Africa. Sculpture, painting, pottery, textiles, architecture and human adornment. Some ancient Stone and Iron Age traditions. Diverse ethnic and regional art traditions practiced in area from 19th century to present.

462 Art and Archaeology of Ancient Africa (3) Historical art traditions of sub-Sahara Africa. Prehistoric rock paintings; art from archaeological sites and ancient kingdoms. First and second millennia B.C. for early terracotta sculpture and rock paintings, 11th through 19th centuries A.D. for later ancient kingdoms.

463 Arts of the African Diaspora (3) Aesthetic, philosophical and religious patterns of African descendants of Brazil, Surinam, Caribbean and United States. Full range of art forms: sculptural and performance traditions, architecture, textile, basketry and pottery art forms.

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

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

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

474 Theory of 20th-Century Art in Europe and America (3) Theoretical basis for modern movement. Analysis and discussion of individual works of art in light of contemporary writings by artists and theorists. Prereq: Western Art I and II, or consent of instructor.


476 History of 20th-Century Painting and Sculpture in Europe (3) Development of Modern and Post-Modern movements in Europe. Investigation of progression of abstraction through more recent conceptual trends. Analysis of work of individual artists such as Picasso, Matisse, and others.

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

483 History of American Sculpture (3) American sculpture from prehistory to 1960’s.

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

489 Studies in Art History (3) Concentration in individually selected area. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

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

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

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

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

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

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

Art Media Arts

GRADUATE COURSES


433 History of Film and Modern Art (3) Study of development and interaction between cinematic arts and visual arts within context of modern art history. Available for Art History credit. (Same as Cinema Studies 433.)

435 Cinematography as Art (3) Continued development of concepts and techniques for creation of film as art form: individual projects. Prereq: Introduction to Cinematography as Art and Media Arts Portfolio Review or consent of instructor. May be repeated. Maximum 9 hrs.

436 Video Art (3) Continued development of concepts and techniques for creation of video works as art form: individual projects. Prereq: Introduction to Cinematography as Art and Media Arts Portfolio Review or consent of instructor. May be repeated. Maximum 9 hrs.

439 Special Topics in Media Arts (3) Student- or instructor-initiated course offered at convenience of department. May be repeated. Maximum 12 hrs.

441 Digital Photography II (4) Continuation of exploration and implications of use of computer in photography. Prereq: Digital Photography I and consent of instructor.

442 Large Format Photography II (4) Studio course that continues exploration of use of large format cameras in photography. Prereq: Large Format Photography I and consent of instructor.

531 Photography I (2-6) May be repeated. Maximum 10 hrs.

532 Photography II (2-6) May be repeated. Maximum 10 hrs.

535 Media Arts I (2-6) May be repeated. Maximum 10 hrs.

536 Media Arts II (2-6) May be repeated. Maximum 10 hrs.

577 Studies in Media as Art (3) Selected topics in theory and history of media as art form. May be repeated. Maximum 9 hrs.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

595 Visiting Artist Seminar (3) Contemporary art issues by different visiting artists. May not be used toward art history requirement. May be repeated. Maximum 12 hrs.

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

Art Painting

GRADUATE COURSES

413 Painting IV (6) Advanced painting, individual concepts and personal expression with varied media. Prereq: Painting III. May be repeated. Maximum 12 hrs.

415 Watercolor IV (6) Advanced painting with water-based media on paper, individual concepts and per-
sonal approaches. Prereq: Watercolor III. 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: Consent of instructor. May be repeated. Maximum 12 hrs.

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

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

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

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

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

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

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

Art Printmaking

GRADUATE COURSES

462 Intaglio III (3-6) Exploration of individual projects through advanced color printing methods and combinations with other print media. Prereq: Intermediate Intaglio or consent of instructor. May be repeated. Maximum 12 hrs.

463 Lithography III (3-6) Exploration of individual projects through advanced lithographic methods in combination with other print media. Prereq: Intermediate Lithography or consent of instructor. May be repeated. Maximum 12 hrs.

464 Screen Printing III (3-6) Individual development of screen printing problems and techniques: development of image and personal concept. Prereq: Intermediate Screen Printing or consent of instructor. May be repeated. Maximum 12 hrs.

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

561 Printmaking I (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 561, 562.

562 Printmaking II (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 561, 562.

563 Printmaking III (2-6) Directed exploration of any or all matrix-based imaging: intaglio, relief, lithography, screen printing, photo-print methods and monoprint. Prereq: 561, 562, 563.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

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

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

Art Sculpture

GRADUATE COURSES

441 Advanced Sculpture (3-6) Individual development of sculptural problems and techniques. Prereq: 6 hrs of 300 level sculpture. May be repeated. Maximum 12 hrs.

449 Special Topics in Sculpture (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Successful completion of any portfolio review. May be repeated. Maximum 12 hrs.

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

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

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of instructor.

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

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

Arrowmont

GRADUATE COURSES

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

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

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

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

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

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

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

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

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

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

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

Astronomy

See Physics and Astronomy

Audiology and Speech Pathology

MAJORS DEGREES

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

Ilsa Schwarz, Head

Professors:
Asp, Carl W., Ph.D. ......................... Ohio State
Carney, Patrick J., Ph.D. ....................... Iowa
Nabelek, Anna (Emeritus), Ph.D. .............. Poland
Nabelek, Igor V. (Emeritus), Sc.D. ...... Prague
Peterson, H. A. (Emeritus), Ph.D. ................. Illinois
Schwarz, Ilsa, Ph.D. ......................... Oregon
Silverstein, B. (Emeritus), Ph.D. ............... Purdue

Assistant Professors:
Burchfield, Samuel B., Ph.D. .......... Michigan State
Hedrick, Mark, Ph.D. ................. Vanderbilt
Payne, Pearl A., Ph.D. ................ Tennessee
Swanson, Lori A., Ph.D. ............... Purdue
Thelin, J. W., Ph.D. ...................... Iowa

Clinical Director:
Michael, Ann, Ph.D. ............... Vanderbilt

Clinical Faculty:
Barnes, Vickie, M.A. ................. Tennessee
Beeler, Julie, M.A. ................ Tennessee
Buehler, Velvet, M.A. ............... Tennessee
Christopher, Kimberly, M.A. ....... Tennessee
DeGennaro, Andrea, M.A. ........ Case Western
Dungan, Jan, M.A. ...................... Tennessee
Edick, Lisa, M.A. ....................... Texas
Genone, Laura, M.A. ................ Tennessee
Hume, Sue, Ph.D. .................... Tennessee
Hutseb, Gayla, M.A. .................. Tennessee
Jenkins, Kimberly, M.A. .......... Tennessee
Johnston, Kristi, M.A. ............... Tennessee
Lewis, Dee, M.A. ....................... Tennessee
Lytle, Susan, M.A. ................. Tennessee
Powell, Pam, M.A. .................. Tennessee
Schay, Nancy, M.A. ................ Tennessee
Searfoss, Marianne, M.A. .......... Tennessee
Sheridan, Carol, M.A. ................. Tennessee
Simpson, Leigh, M.A. ................ Tennessee
Singletary, Theronne, M.S. .... Colorado State
Thomason, Tanya, M.A. ............. Tennessee
Valentine, Dan, M.A. ................. Tennessee
Vaughn, Teresa, M.S. .......... Eastern Kentucky
Ward, Tracey, M.S. .......... East Tennessee State
Webb, Patricia, M.Ed. ............. Florida
Yeager, Kelly, B.S. ................. South Alabama

Effective Fall 2003, the Doctor of Audiology (Au.D.) with a major in Audiology will be offered. At that time the Master of Arts degree program with a major in Audiology will be terminated. Contact the department for complete details.
THE MASTER’S PROGRAM

A major is offered in Audiology or in Speech Pathology. Admission to these graduate programs is competitive. Both of these graduate programs are accredited by the Council on Academic Accreditation of the American Speech-Language-Hearing Association.

The master’s degree program in speech pathology is a two-year program and consists of the completion of 42 semester hours of academic content courses (including thesis) plus practicum. A minimum of three academic courses must be completed during all semesters (terms) except one. That is, students must take a minimum of nine semester hours of academic coursework for at least four semesters or terms and six semester hours in the other semester or term.

The required courses are 506, 511, 526, 561, 582, 539 or 541, 520 or 524, and at least two seminars from the following courses: 522, 523, 524, 525, or 561 and at least 15 hours of elective courses. Undergraduate coursework may not be substituted for seminar courses. Students who have not completed an undergraduate course in each of the following three areas: articulation/phonological processing disorders, voice disorders, and fluency disorders, must complete one graduate course in each of the three areas.

Students majoring in speech pathology may elect either the thesis or non-thesis option. The master’s program in speech pathology with thesis includes six hours of 500 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. Students in the non-thesis option must pass a final written examination.

Students majoring in audiology may elect either the thesis or non-thesis option. Students in audiology are required to take 511. The master’s program with thesis will include a minimum of 33 semester hours of approved graduate credit in audiology, including 500 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least two-thirds of these total 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 non-thesis option program must present a total of 39 semester hours in the audiology program of approved graduate credit and pass a final written examination.

Graduate students in both Audiology and Speech Pathology may pursue a concentration in the area of aural habilitation. Admission to the aural habilitation concentration is competitive and applications will be processed during the first year of graduate study. The concentration requires: (1) Three semesters of clinical practicum in treatment of children with hearing impairments, totaling a minimum of 130 clock hours; and (2) completion of 6 hours of graduate level courses in language, audiology, and/or aural habilitation. Specific requirements are outlined in the Graduate Handbook for Audiology and Speech-Language Pathology, as well as on the Departmental website (http://web.utk.edu/~aspweb/).

THE DOCTORAL PROGRAM

The Ph.D. program in Speech and Hearing Science seeks to develop individuals for professional careers in a variety of positions including academic teaching, research in the concentration areas of speech and language pathology, audiology, speech-language science or hearing science. The degree program is research oriented with primary emphasis on processes involved in normal, or disordered speech, language and hearing. Students will be expected to demonstrate their knowledge in areas related to the concentrated field of study. These areas include:

1. Basic speech, hearing, or language processes;
2. Basic speech, hearing, or language disorders or differences;
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 coursework within the department of which:
   a. a minimum of 6 semester hours in the topic(s) of major interest;
   b. a minimum of 6 semester hours in topic(s) of related interest;
   c. 3 semester hours in 611; and
   d. 3 semester hours in supervised teaching experience.
5. A comprehensive examination to demonstrate knowledge in the concentration area and an examination of research competence.
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 on an in-state tuition basis. The M.A. program in Audiology is available to residents of the state of South Carolina. The Ph.D. program in Speech and Hearing Science is available to residents of the states of Arkansas or Delaware. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

431 Stuttering (3) Nature, appraisal and treatment. Prereq: 300 Introduction to Communication Disorders or consent of instructor.

433 Observation of Clinical Practice (1) Prereq: 320 Speech and Language Development or consent of instructor.

434 Clinical Practice in Speech-Language Pathology II (1-4) Prereq: 433 and consent of instructor.

Enrollment for fewer than 2 hrs must have prior departmental approval.

435 Introduction to Speech Sound Disorders (3) Etiology, diagnosis, and treatment of articulatory and phonological disorders. Prereq: 300 Introduction to Communication Disorders, 305 Phonetics, or consent of instructor.

440 Voice Disorders (3) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 300 Introduction to Communication Disorders, 305 Anatomy and Physiology of Speech, or consent of instructor.

455 Problems in Speech Pathology (1-3) Prereq: Consent of instructor.

461 Introduction to Language Pathology in Children (3) Nature, etiology and treatment of language retardation in children. Prereq: 305 Phonetics and 473 or equivalents or consent of instructor.

473 Introduction to Audiologic Assessment (3) Basic principles of clinical audiometry; pure tone, speech, masking and overview of special auditory tests. Prereq: 303 Introduction to Hearing Science.

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, compensation and remediation of adults, effects of aging/remediation on the elderly, and case studies. Prereq: 305 Phonetics and 473 or equivalents or consent of instructor.

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

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

504 Appraisal of Speech and Language Disorders (3) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: 300 Introduction to Communication Disorders, 305 Phonetics, and 473 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 statistical application of statistics, and completion of a proposal and hypothetical pilot research project.

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

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

514 Practicum in Verbo-Tonal Habilitation (1-4) Prereq: 494, 585, 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; laboratory assignments 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 in Articulation and Phonological Processing Disorders (3) Current research in diagnosis and management of articulation and phonological...
523 Seminar in Voice Disorders (3) Current research in diagnosis and management of voice disorders. Multicultural, gender and age-related issues. Prereq: 440 or consent of instructor.

524 Traumatic Brain Injury (3) Advanced neurogenics: cognitive–linguistic emphasis. Medical and speech-language pathology rehabilitation issues associated with traumatic brain injury (TBI) related to adult TBI population. Prereq: 506 and 523, or consent of instructor.

526 Dysphagia (3) Clinical diagnosis, evaluation, and treatment of adult swallowing disorders and critical interpretation of research literature on dysphagia. Prereq: Consent of instructor.

529 Seminar on Stuttering (3) Current significant research in stuttering. Prereq: 431 or consent of instructor.

532-33-34 Advanced Clinical Practice in Speech-Language Pathology (1-4, 1-4, 1-4) Prereq: 434 or equivalent and consent of instructor. 534 may be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

535-36 Advanced Clinical Practice in Speech-Language Pathology: Off-Campus Sites (1-4, 1-4) Prereq: 100 hrs clinical experience, consent of instructor. May be repeated. Maximum 6 hrs each. Enrollment for less than 2 semester hrs must have prior departmental approval.

538 Advanced Clinical Practice in Speech-Language Pathology: Public Schools (1-4) Prereq: 200 hrs of experience in college teaching. May be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.


540 Structural Speech Disorders (3) Etiology, diagnosis and clinical management of craniofacial speech disorders and laryngectomy. Prereq: 306 Anatomy and Physiology of Speech and 435.

541 Pediatric Oromotor Disorders (3) Evaluation, diagnosis, and treatment of pediatric oromotor disabilities that affect normal acquisition of feeding and speech, orofacial dyspraxia and oromotor apraxia. Prereq: Consent of instructor.

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

543 Amplification Technology (3) Description of hearing aid circuits, components and performance characteristics. Electroacoustical and real-ear analysis of hearing aids. Coupler material and geometry effects. Practical experience in troubleshooting, repair, and construction of hearing aids. Prereq: 473 and 507 or equivalents 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 Advanced Audiology (3) Theoretical bases for behavioral, auditory 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 3 hrs.

548 Special Study in Audiology (1-3) Special reading, consultation, and research activities in field 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) Current significant research in speech pathology. Topics vary. Prereq: 9 hrs in speech pathology. May be repeated with consent of department. Maximum 9 hrs.

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

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

558 Phonological Disorders (3) Current theories and approaches to assessment and intervention for individuals with difficulty acquiring or using speech sound system of English. Prereq: 435 or equivalent or consent of instructor.

561 Child Language Disorders (3) Current literature on assessment and intervention techniques for young language learners. Prereq: 461 or equivalent or consent of instructor.

563 Language Disorders: Birth to Three (3) Overview of family-focused, transdisciplinary intervention process. Assessment/treatment of infants, toddlers, and preschoolers. Description of disabilities and resulting communicative disorder. Prereq: 481 or equivalent or consent of instructor.

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

576 Electrophysiological Assessment of Auditory Function (3) Evoked potentials and their anatomical origin. Use of various evoked potentials in evaluation of auditory function and determination of site(s) of lesion. Prereq: 473, 507, and 546, or equivalents or consent of instructor.

577 Vestibular Disorders (3) Anatomy, physiology, and pathophysiology of vestibular system and other systems that contribute to balance. Practice in electrystromyography. Prereq: 507, 542, 546, and 576 or equivalents or consent of instructor.

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

582 Speech and Language Services in School (3) Organization and implementation of speech and language programs in schools.

591 Foreign Study (1-15) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.

592 Off-Campus Study (1-15) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.

593 Independent Study (1-15) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.

594 Advanced Aural Habilitation/Rehabilitation of the Hearing-Impaired (3) Study of grieving process, counseling, group and individual amplification systems, classroom/speech acoustics, central auditory problems, therapy methods for habilitation and rehabilitation, speech reading, school-based programs, programs for adults and the elderly; student research reports. Prereq: completion of Auditory/Speech Perception (3) and 544 or equivalent or consent of instructor.

Professors:
Collins, F. G., Ph.D. ................. California
Kimberlin, R. D. (Liaison), Ph.D. .................. RWTH(Germany)
Mason, A. E. (Emeritus), Ph.D. .... Tennessee
Paludan, C. Т. (Emeritus), Ph.D. ........ Denver
Wu, J. M. (Emeritus), Ph.D. .............. Cal Tech
Young, R. L. (Emeritus), Ph.D. ............ Northwestern

Associate Professors:
Lewis, William D., Ph.D. ............ Georgia Tech
Solies, U. P., Ph.D. .................... Tennessee

Research Assistant Professor:
Stellar, Frederick W., M.S. .......... Georgia Tech

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 in areas pertinent to aviation. Current emphases include flight testing, aircraft design, aviation meteorology, air traffic control, and airport management.

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from an accredited institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee Graduate 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. Both options are fully supported off-campus utilizing electronic media for videotaping and interactive distance teaching methods.

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. Twelve hours of electives in the major field, mathematics or engineering.
4. Twelve hours of electives in the major field, mathematics or engineering.
5. Three hours of an assigned project under Aviation Systems 550.
6. 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.
5. Three hours of an assigned project under Aviation Systems 550.
6. A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

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

502 Registration for Use of Facilities (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.

503 Air Vehicles (3) Current capabilities and future requirements for civilian and military air vehicles. Performance parameters significant for air vehicle type selection. Integration of air vehicle into aviation systems. Prerequisite: 501.
Biochemistry and Cellular and Molecular Biology

(College of Arts and Sciences)

MAJOR DEGREES

Biochemistry and Cellular and Molecular Biology .................. M.S., Ph.D.

Bruce D. McKee, Head

Professors:

Bagby, R. M., Ph.D. ............................... Illinois
Becker, J. M., Ph.D. ............................... Cincinnati
Carlson, J. G. (Emeritus) (Distinguished Prof.), Ph.D. ................. Pennsylvania
Handel, Mary Ann (Distinguished Prof.), Ph.D. .......................... Kansas State
Hochman, Ben (Emeritus), Ph.D. .......................... California
Howell, Elizabeth E., Ph.D. .................................. Lehigh
Jeon, K. W., Ph.D. ....................................... London
Joshi, J. G. (Emeritus), Ph.D. .................................. Poona
Kennedy, J. R., Ph.D. ..................................... Iowa
Koontz, John W. (Liaison), Ph.D. ....... Kentucky
Liles, J. N. (Emeritus), Ph.D. ............... Ohio State
MacCabe, J.A, Ph.D. ................................. California (Davis)
McKee, B. D., Ph.D. ................................. Michigan State
Monty, Kenneth J., Ph.D. ............................. Rochester
Roberts, Daniel M., Ph.D. ............................. California (Davis)
Roth, L. Evans (Emeritus), Ph.D. ......... Chicago
Salo, T. P. (Emeritus), Ph.D. ....................... Michigan
Serpersu, Engin H., Ph.D. ......................... Harvard
Shivers, C. A. (Emeritus), Ph.D. .................... Michigan State
Welch, H. G. (Emeritus), Ph.D. ............... Florida
Whistlon, G. L. (Emeritus), Ph.D. ............... Iowa
Wicks, Wesley D., Ph.D. ............................. Harvard

Associate Professors:

Bruce, Barry, Ph.D. ............................... California
Ganguly, R., Ph.D. ................................. Nebraska
Hall, J. C., Ph.D. ....................................... Illinois

Peterson, Cynthia B., Ph.D. ................. LSU
Prosser, R. A., Ph.D. ................................. Illinois

Assistant Professors:

Dealwis, C., Ph.D. .............................. London
Fernandez, E., Ph.D. ............................... Loyola
Park, J., Ph.D. ................................. Texas A&M

Research Professors:

Mazur, Peter, Ph.D. .............................. Harvard
Rinchik, Eugene, Ph.D. ........................... Duke

Research Assistant Professor:

Kleibig, Mitch, Ph.D. .............................. Tennessee

REQUIREMENTS FOR ADMISSION

Applicants for graduate study are expected to have a background equivalent to that required of undergraduate majors in this department. This includes a knowledge of the basic principles of biochemistry, cell biology, genetics and physiology. Requirements for admission are:

1. One year of general biology or the equivalent;
2. A minimum of 8 semester hours of approved biology courses beyond the introductory level and including the subject areas of genetics, cell biology and physiology;
3. Two years of chemistry including one year of general chemistry and one year of Introductory Organic Chemistry with laboratory;
4. At least one semester of biochemistry;
5. One year of calculus;
6. One year of physics;
7. Graduate Record Examination scores; and
8. A minimum 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 Recruiting Committee.

THE MASTER'S PROGRAM

1. Biochemistry and Cellular and Molecular Biology 511-12-13, 515-16, and 517
2. Completion of course requirements as determined by the candidate's faculty committee.
3. Achievement of a 3.0 or better GPA in all courses taken for graduate credit.
4. Participation in at least one journal club chosen from among 605-608 for six semesters.
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. Biochemistry and Cellular and Molecular Biology 511-12-13, 515-16, and 517.
2. At least two additional approved graduate courses in the life sciences or chemistry, or physics, or other physical science to be determined upon consultation with the dissertation committee. No survey courses will be accepted.
3. At least 6 hours of topics offered in 615 or its equivalent.
4. Participation in 601 and 603 during the entire period of residence. Participation in at least one journal club chosen from among 605-608 for six semesters.
5. Comprehensive examination taken before the end of the third year of study.
6. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
7. A final oral examination which will be concerned primarily with the student's dissertation.

Petitioning for Master's Degree

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

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

GRADUATE COURSES

401-402 Biochemistry-Molecular Biology I, II (3.3)
401—Amino acid structure and chemistry, protein structure and chemistry, protein folding, enzyme behavior and function, reaction mechanisms, catalysis and energy transfer, synthetic metabolism including photosynthesis, and protein transport. 402—Structure of DNA and RNA, experimental methods of analyzing nucleic acids, mechanisms of RNA and protein synthesis, mechanisms of DNA replication, repair and recombination, chromosome structure and function, regulation of gene expression, genome structure and genomics, and mechanisms of biological regulation. Prereq: Biology 240 General Genetics, Chemistry 350-360-369 Organic Chemistry and Lab.

403 Advanced Genetics Laboratory (3) Experiments illustrating methods in modern genetics: techniques in classical, cyt-, molecular and developmental genetics. Model organisms, Drosophila and mouse. Prereq: General Genetics and Organic Chemistry.

410 Cellular and Comparative Biochemistry (4)
Electrolyte behavior, chemistry and structure of proteins; enzyme behavior and biological function; catalysis and energy capture; synthetic metabolism; nucleic acid function; protein synthesis, and biochemical genetics; regulation of biological processes. May not be counted if credit received for 401. Prereq: Chemistry 350-360-369 Organic Chemistry and Lab., Biology 140 Organization and Function of the Cell, and Biology 240 General Genetics. 3 hrs and 1 discussion. Sp.

419 Cellular and Comparative Biochemistry Lab (2) Experiments with enzymes, nucleic acids, and membranes and organelles. Chromatography, kinetics, hybridization, sequencing, and immunochemical methods. Prereq or coreq: 401 or 410. F,Sp

421 Cell and Tissue Structure and Function (4)
Study of animal cells and tissues at light and electron microscopy levels. Prereq: Biology 140 Organization and Function of the Cell. 2 hrs and 2 labs.

429 Cell Biology Laboratory (3) Series of open-ended, discovery-based exercises developed to design and test new drugs using modern cell biology and computer technologies. Experimental modules: techniques used in cell isolation, purification, culturing,
fluorescent microscopy, receptor binding and signal transduction, apoptosis, cell cycle analysis, protein and steroid secretion, computer modeling, and state-of-the-art experimental design, execution, data analysis, and peer evaluation. Prereq or coreq: 401 or 410. F


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

480 Physiology of Exercise (3) (Same as Exercise Science 480.)

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

502 Registration for Use of Facilities (1-15) Required for the use of facilities 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

511 Advanced Protein Chemistry and Cellular Biology (3) Cellular structure and function at molecular and supramolecular level in progression: protein structure and function; membrane structure and function; bioenergetics and membrane proteins. Prereq: Prior knowledge of cell biology and biochemistry and/or consent of instructor. F

512 Advanced Molecular Biology (3) Regulation of nucleic acid expression and protein activity. Nucleic acid structure and function; replication and repair of nucleic acids; gene expression; protein synthesis; post-translational protein modification; mitosis and meiosis; cell cycle and cell growth. Prereq: 511 or consent of instructor. Sp

513 Advanced Protein Biochemistry and Cell Biology II (3) Advanced topics of cellular function and regulation of cell division and growth, and structure and function of supramolecular structures: cytoskeleton and cell junctions and adhesions. Prereq: 511. Sp

515 Experimental Techniques 1 (4) Modern experimental methodology and instrumentation lab. cell growth; spectrophotometry; microscopy; nucleic acid purification and analysis; protein assays; enzyme purification; electrophysiology; computer analysis of nucleic acid and protein sequences. Lecture on theory of laboratory to accompany two lab periods per week. Primarily for departmental graduate students. Prereq: Consent of instructor. F

516 Experimental Techniques 11 (3) Laboratory rotations. Students work in laboratory of faculty member on clearly defined project. Written proposal and oral report. Primarily for departmental graduate students. Prereq: 515. S/NC only. Sp

517 Physical Biochemistry (3) Physics and chemistry of biological systems and molecules. Thermodynamics; diffusion and transport; physical chemistry of macromolecules; enzyme kinetics; binding reactions; spectroscopy; electrophysiology. Prereq: 511 or consent of instructor. F

520 Special Topics (1-2) Selected directed readings or special course in topics of current interest. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 6 hrs. S/NC only.

525 Graduate Research Participation (3-12) Tutorial laboratory experience. May be repeated. Maximum 12 hrs. F

530 Experimental Design and Analysis (3) Development of skills in experimental design and interpretation of experimental results. Critical discussion of research articles illustrating issues in experimental design. Preparation of grant proposal in standard format to be read and discussed by class and by panel of faculty expert in area of proposal. Prereq: 511-12-13, 515-16-17. Sp

550 Advanced Concepts in Neurobiology/Physiology (3) Concepts related to neurobiology/physiology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

552 Physiology of Hormones (3) Cellular and organonal action of hormones in invertebrate and vertebrate animals. Prereq: Consent of instructor. Recommended prereq: 410. 2 hrs and 1 lab. Sp

560 Advanced Concepts in Structural Biology/ Biochemistry (3) Concepts related to structural biology/biochemistry with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

561 Environmental Toxicology (3) (Same as Ecology and Evolutionary Biology 561.)

562 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, special project. Admission limited only to departmentally approved graduate students. (Same as Botany 510.) 2-3 hr labs. Sp

564 Introduction to Electron Microscopy-Scanning Electron Microscope (3) Practical introduction to techniques of electron microscopy and to scanning electron microscope. Use of microscope, introduction to darkroom techniques and digital image processing, preparation of samples for observation, and special project. Prereq: Consent of instructor. 2 hrs and 1 lab. Sp

570 Advanced Concepts in Cellular/Molecular Biology (3) Concepts related to cellular/molecular biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

580 Advanced Concepts in Genetics/Developmental Biology (3) Concepts related to genetics/developmental biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Prereq: Consent of instructor. May be repeated.

581 Independent Study (1-15) P/NP only. Sp

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

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

603 Graduate Research Colloquium (1) Seminars and lectures dealing with current advances in fields of biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell ultrastructure and physiology, neurobiology, and related topics. Required every semester in residence. S/NC only. F, Sp

605 Journal Club in Neurophysiology/Physiology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs. S/NC only.

606 Journal Club in Structural Biology/Biochemistry (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs. S/NC only.

607 Journal Club in Cellular/Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs. S/NC only.


610 Current Topics in Biochemistry, Cellular, and Molecular Biology (1-2) Critical reviews of research problems and methods in biochemistry, cell biology and/or molecular biology. Oral presentations, written reports, computer simulations by faculty and students. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

612 Advanced Topics in Environmental Toxicology (1-3) (Same as Ecology and Evolutionary Biology 612.)

615 Special Topics in Biochemistry, Cellular, and Molecular Biology (3) Biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell ultrastructure and physiology, neurobiology, and related topics. Prereq: 511-12 or consent of instructor. May be repeated. Maximum 9 hrs.

Biosystems Engineering and Environmental Science

(Majors of Agricultural Sciences and Natural Resources)

MAJORS DEGREES

Biosystems Engineering ................. M.S., Ph.D.
Biosystems Engineering Technology .... M.S.
Plant and Soil Sciences ................. M.S., Ph.D.

Ronald E. Yoder, Head

Professors:

Ammon, J. Tom, Ph.D. ................. West Virginia
Ayers, P. D., PE, Ph.D. ............... NC State
Bell, F. F. (Emeritus), Ph.D. .......... Iowa State
Buschermohle, M. J., Ph.D. .......... Clemson
Denton, H. P., Ph.D. ................. NC State
Foss, J. E. (Emeritus), Ph.D. ....... Minnesota
Henry, Z. A. (Emeritus), Ph.D. ...... NC State
Luttrell, D. H. (Emeritus), Ph.D. .... Iowa State
McDow, J. J. (Emeritus), Ph.D. ...... Michigan State
Mote, C. R., Ph.D. ................. Ohio State
Sewell, J. I. (Emeritus), Ph.D. ....... NC State
Shelton, C. H. (Emeritus), M.S. .... VPI
Springer, M. E. (Emeritus), Ph.D. .......... California
Tompkins, F. D., PE, Ph.D. .......... Tennessee
Tyler, D. D., Ph.D. ................. Kentucky
Wilhelm, L. R., PE, Ph.D. .......... Tennessee
Wills, J. B., M.S. ................. Tennessee
Yoder, D. C., Ph.D. ............... Purdue
Yoder, R. E. (Liaison), PE, Ph.D. .......... Colorado State

Associate Professors:

Burns, R. T., PE, Ph.D. .......... Tennessee
Essington, M. E., Ph.D. .......... California (Riverside)
Freeland, R. S., PE, Ph.D. .......... Tennessee
Grandle, G. F., Ph.D. .......... Tennessee
Hart, W. E., Ph.D. ............... Purdue
Logan, J., Ph.D. ............... Nebraska
Pordesimo, L. O., Ph.D. .......... Penn State
Raman, D. R., PE, Ph.D. .......... Cornell
Graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Biosystems 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 Biosystems Engineering Technology is available to graduates in a recognized curriculum in agriculture or other related fields. These programs emphasize the application of engineering and engineering technology to agricultural and other biological systems. Major focus areas of the program are machinery systems; environmental quality and resource conservation; instrumentation, sensor, and control systems; and bioprocessing. Prerequisite courses may be required depending upon the applicant’s academic background and interest area within the program.

An interdepartmental graduate program in Plant and Soil Sciences is jointly offered by the Biosystems Engineering and Environmental Science Department and the Plant Sciences and Landscape Systems Department. This program offers the Master of Science and Doctor of Philosophy degrees. See the Department of Plant Sciences and Landscape Systems for major courses offered and a description of degree requirements. Subject to approval of the student’s graduate committee and program faculty involved, some exceptions to the specific course requirements may be allowed. However, any exception must be consistent with the University requirements and the overall objectives of the degree program.

A completed departmental data sheet and three completed Graduate Rating Forms are required in addition to the Application for Graduate Admission. International students must submit scores from the GRE general examination. Each applicant will be advised about any prerequisite courses before entering a program. The student’s program of study must be approved by his/her advisory committee and must comply with the requirements of The Graduate Council. 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 Biosystems Engineering 505 and other departmental seminars regardless of whether they are registered for seminar credit.

### THE MASTER’S PROGRAMS

#### Biosystems Engineering

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:

- Biosystems Engineering 507 (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 505

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.

#### Biosystems Engineering Technology

**Thesis Option:** 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:

- Biosystems Engineering Technology 507 (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 505

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 Biosystems Engineering Technology is available to qualified students. 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:

- Biosystems Engineering Technology 507 (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 505

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.

#### Plant and Soil Sciences

The environmental and soil sciences faculty in the Department of Biosystems Engineering and Environmental Science participate in the Plant and Soil Sciences Master’s degree program offered jointly by the Department of Biosystems Engineering and Environmental Science and the Department of Plant Sciences and Landscape Systems.

### THE DOCTORAL PROGRAM

#### Biosystems Engineering

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. To earn a degree, each doctoral student must complete at least 75 hours of approved graduate credit (beyond the baccalaureate degree) in Biosystems 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 UT 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)
- Program electives
- Seminar (507, 505 or equivalent courses)
- 600 Dissertation

In addition to completing the minimum 75 hours of graduate credit required for a degree, each doctoral student must also pass a comprehensive examination as required by the Graduate Council.

#### Plant and Soil Sciences

The environmental and soil sciences faculty in the Department of Biosystems Engineering and Environmental Science participate in the Plant and Soil Sciences 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 major in one or more cognate areas. Major courses include those in: Plant and Soil Sciences, Environmental and Soil Sciences, Integrated Plant Systems, Ornamental...

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 any cognate fields, direct the research, and recommend the dissertation for approval and acceptance by the Office of Graduate Student Services.

See the Department of Plant Sciences and Landscape Systems for additional details and additional major courses offered.

### Biosystems Engineering

#### GRADUATE COURSES


421 Natural Resource Engineering (3) Introduction to hydrologic cycle: movement of water and interaction with environment through such processes as erosion and contamination. Impacts through estimation and measurement, and controlling impacts through engineering design. Specific designs: waterways, erosion and sediment control structures, waste management systems, irrigation systems, and hydrologic monitoring systems. Prereq: 321 Fluid Mechanics, Environmental and Soil Sciences 210 Introduction to Soil Science, Civil Engineering 330 Fluid Mechanics, Aerospace Engineering 341 Fluid Mechanics. 2 hrs and 1 lab. F

431 Bioprocessing Engineering (3) Application of basic engineering principles to processing and handling of biological materials. Materials: chemical, biological properties; materials handling; material conversion operations; drying; heat and bioprocessing, Prereq: 321 Biothermodynamics, Heat and Mass Transfer, Mathematics 231 Differential Equations 1, 2 hours and 1 lab. Sp

441 Life Systems Engineering (3) Design of controlled environments to optimize conditions for organism growth and development: growth equations and population dynamics; plant growth systems; microbial growth systems; animal growth systems; biotechnological applications. Prereq: 321 Biothermodynamics, Heat and Mass Transfer, Mathematics 231 Differential Equations 1, 2 hours and 1 lab. Sp

451 Electronic Systems (4) Basic electronics with biological applications. Analog and digital electronics; sensing and controlling physical and environmental parameters; sensor selection and interfacing; signal conditioning; process control; Laboratory experiments and design projects. Prereq: Circuits and Electro Mechanical Components. 3 hrs and 1 lab. Sp

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during a particular 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 Professional Communications Seminar (1) Reviews, reports and discussion of ideas, recent advances and current topics: presentations by students. Should be taken in last full semester before graduation. Prereq: 504. May be repeated in doctoral program. Maximum 2 hrs. (Same as Biosystems Engineering Technology 505.) S/NC only. E

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

510 Similitude in Design and Research (3) Dimensional analysis, governing equations; theory of models; true, distorted, dissimilar models; prediction equations; interpretation of data; applications to machinery, soil and water structures, agricultural buildings and other agricultural engineering related problems. Prereq: Engineering Science 521, 341. 2 hr and 1 lab. F,A

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

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

541 Principles of Compost Engineering (3) Comprehensive study of composting: survey of installed systems; thermodynamics of composting; biology of composting; kinetics of heat inactivation, feed conditioning, aeration; substrate characteristics; composting process kinetics; and odor control. Design component. Prereq: Thermodynamics, heat and mass transfer. F

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.)

545 Monitoring Hydrologic Phenomena (3) Application of instrumentation theory to monitoring hydrologic phenomena: strengths and weaknesses of current equipment and strategies; equipment operation and solutions of environmental problems. Prereq: 543 and knowledge of basic hydrology. 2 hrs and 1 lab. (Same as Environmental Engineering 545.)

550 Selected Topics (1-3) Lecture/group discussion on specialized topics. May be repeated. Maximum 6 hrs.

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

555 GIS and GPS Applications to Biosystems (3) Theory and applications of Geographical Information Systems (GIS) and Global Positioning Systems (GPS); application to food, natural resource, and environmental problems. Prereq: 231 Calculus and knowledge of basic hydrology. 2 hrs and 1 lab.

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/NP only. E

620 Computer Simulation of Agricultural Systems (3) Scientific approach to digital simulation: formulation of mathematical models; numerical solution of system equations; computer software; model validation and verification; computer programming of computer simulation software; Practical applications of computer simulations in agriculture. Prereq: 541 or equivalent. 2 hrs and 1 lab. W

630 Feedback and Control Systems (3) Differential equations for physical systems: solutions, transforms, and system response. Types of control, frequency response, design of controllers, computer simulation. Application to agricultural systems. Prereq: 451 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

## Biosystems Engineering Technology

### GRADUATE COURSES

422 Food and Process Engineering Technology (3) Application of basic engineering principles to agricultural production processes: drying, refrigeration, heat and mass transfer, fluid handling and processing, evaporation, thermal processing, heating and cooling, refrigeration systems, and materials handling. Prereq: Basic physics. 2 hrs and 1 lab.

432 Agricultural Machinery and Tractors (3) Functional selection, matching, and management of agricultural machinery systems. Tractor power ratings, engine and transmission systems, hydraulic systems, hitches, and ballasting. Field and material capacity, field efficiency, cost analysis, and machinery replacement strategies. Functional analyses of tillage operations, planters and drills, no-tillage systems, hay harvest systems, forage and small grain harvesting, and cotton harvesting. Crop drying processes, off-road machinery safety considerations, and operator ergonomics. Prereq: Mathematics 123 Based Calculus or 125 Finite Mathematics or consent of instructor. 2 hrs and 1 lab.

442 Agricultural Waste Management and Pollution Control (3) Waste renovation fundamentals; characteristics of animal manure; techniques for collection, transporting, storing, and utilizing livestock waste. Prereq: Basic Calculus or Finite Mathematics or equivalent. 2 hrs and 1 lab.

452 Small Internal Combustion Engines (3) Theory, concepts, and mechanics of small internal combustion engines; theoretical cycles; selection, operation, adjustment, troubleshooting and repair of single-cylinder engines. Prereq: Basic calculus or finite mathematics or equivalent or consent of instructor. 2 hrs and 1 lab.

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

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

506 Physical Phenomena (3) Properties of materials, fundamentals of hydraulics, principles of electricity, thermal phenomena, applications in biological systems. Prereq: Consent of instructor. 2 hrs and 1 lab.

507 Professional Development Seminar (1) (Same as Agricultural and Natural Resources 507, Animal Science 507, Biosystems Engineering 507, Food Science and Technology 507, Ornamental Horticulture and Landscape Design 507, and Plant and Soil Sciences 507.) S/NC only. E

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

514 CAD Applications to Biosystems Engineering (3) Computer Aided Drafting (CAD) applications in agricultural and environmental systems: use of CAD software to create drawings of components, systems, flow charts, and process diagrams. Applications in mechanical, structural, and biosystems. 2D applications with limited exposure to 3D applications. Prereq: Computer intensive course. Hands-on experience. Prereq: Computer proficiency and admission to graduate program. (Students cannot receive credit for both 414 CAD Applications to Biosystems Engineering and 514.) Two 2-hr labs.
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

532 On-Site Domestic Water Supply and Wastewater Renovation (3) Basic ground water hydrology, selection and design of pumps and delivery systems, and point-of-use water treatment processes; soil-based wastewater renovation principles, 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

555 GIS and GPS Applications to Biosystems (3) (Same as Biosystems Engineering 555.)

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

574 Environmental Instrumentation and Monitoring (3) Equipment and techniques commonly used to measure all aspects of hydrologic cycle: precipitation, runoff, streamflow, subsurface water movement. Sampling of all flows for contaminants. Design of monitoring systems. Analysis of data. Prereq: Environmental and Soil Sciences 324 Soil and Water Conservation, Statistics 201 Introduction to Statistics, Mathematics 152 Mathematics for the Life Sciences II, or consent of instructor. (Students cannot receive credit for both 474 Environmental Instrumentation and Monitoring and 574.) 2 hrs and 1 lab. Sp.

Environmental and Soil Sciences

GRADUATE COURSES

434 Environmental Soil Chemistry (3) Composition and chemical properties of soils and processes that govern fate and behavior of chemicals in soil environment: clay mineralogy; soil organic matter; mineral weathering and stability; aeration; precipitation; soil chemistry; ion exchange, adsorption and soil retention; oxidation-reduction; and soil acidity, alkalinity, and salinity. Prereq: Soil science and organic chemistry or equivalent. F

442 Soil Genes and Classification (3) Soil genes and formation; observing and describing morphology of agricultural and forest soils; chemical and physical properties; classification. 3 weekend field trips. Prereq: Soil science. 2 hrs and 1 lab. F

444 Environmental Soil Physics (3) Basic understanding of soil physical properties and processes; practical experience in measurement and analysis of soil physical properties; methods of analysis related to agricultural, environmental, and engineering issues. Prereq: 210 Introduction to Soil Science and Physics 221 Elements of Physics or equivalent. 2 hrs and 1 lab. Sp

462 Environmental Climatology (3) Study of atmosphere as environment. Physical, chemical and biological factors affecting climates of various earth environments; meteorological process affecting biosystems. Climatic change and the human impact on the atmosphere, consequences of climatic change and mitigation policies, microclimates and urban climates, atmospheric pollution, extreme events and ozone depletion. Design and operation of weather information systems; automated weather stations. Prereq: Agriculture and Natural Resources 290 Computer Applications to Problem Solving or equivalent.

481 Capstone in Environmental and Soil Sciences (3) Integrative course in which students work individually and collaboratively to develop solutions for soil and water related environmental problems. Writing and oral communication emphasis course. Prereq: 434 and senior standing. Sp,A

Botany

(College of Arts and Sciences)

MAJOR DEGREES

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

Edward E. Schilling, Head

Professors:
Caponetti, J. D. (Emeritus), Ph.D. ....... Harvard

Clebsch, E. E. C. (Emeritus), Ph.D. ....... Duke

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

Evans, A. M. (Emeritus), Ph.D. ......... Michigan

Heilman, A. S. (Emeritus), Ph.D. ......... Ohio State

Hendron, W. R. (Emeritus), Ph.D. ....... Vanderbilt

Hickok, L. G. (Emeritus), Ph.D. ......... Massachusetts

Holton, R. W. (Emeritus), Ph.D. ......... Michigan

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

Mullin, B. C., Ph.D. ................. North Carolina State

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

Schilling, E. E. (Laison), Ph.D. ........... Indiana

Schwarz, O. J., Ph.D. ........ North Carolina State

Walne, P. L. (Emeritus), Ph.D. ............ Texas

Associate Professors:
Amundsen, C. C., Ph.D. ............... Colorado

Pigliucci, M., Ph.D. ...................... Connecticut

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

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

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

Nebenfuhr, A., Ph.D. ............... Oregon State

Small, R. L., Ph.D. ............... Iowa State

von Arnim, A. G., Ph.D. .......... East Anglia (UK)

Lecturer:
McFarland, K. D., Ph.D. .............. Tennessee

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

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

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

ADMISSION REQUIREMENTS

The Botany Department requires scores from the general portion 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; organic chemistry: 8 semester hours. Physics highly recommended.

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

Evidence of a broad undergraduate background, an ability to do work of graduate quality, and an interest in the study of plant science are considered to be much more important than the particular courses taken as an undergraduate. Accordingly, students lacking 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-tem committee during the first meeting with the student.

THE MASTER'S PROGRAM

The program for the Master of Science is patterned to fit the needs of students who desire a less extensive course of study than the Ph.D. program. However, the 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 500.

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.

Botany 67
3. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.
4. Satisfactory performance on a final written examination on all work offered for the degree. The student’s committee may also require that an oral examination follow the written examination.

THE DOCTORAL PROGRAM
The Doctor of Philosophy program is patterned to provide training that involves extensive independent research within the student’s area of concentration. Although there is no formal program of coursework, the student’s committee may require specific opportunities to develop an interdisciplinary specialization in environmental policy. Most students spend from three to five years working on their Ph.D.

Requirements for successful completion of the Ph.D. are as follows:
1. Satisfactory presentation of a research problem by means of a written proposal and an oral defense to the student’s committee. This must be completed before enrollment in Botany 600.
2. Satisfactory performance on a written comprehensive examination.
3. Presentation of one or more cognate areas outside of the department totaling 6 hours of graduate credit with at least a B average.
4. Satisfactory performance on an examination in one modern foreign language (see Graduate Coordinator) or an A or B in French 302 or German 332.
5. Satisfactory completion of 6 hours at the 600 level (excluding dissertation).
7. Presentation of a departmental seminar near the end of the doctoral program.

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

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

GRADUATE COURSES

401 Field Studies in Botany (1-3) Field experience and taxonomy of special plant groups. Topics vary: bryology, lichenology, agrostology, mycology, phycology, aquatic vascular plants, synantherology, woody plants, and botanical photography. May be repeated under different topic. Maximum 9 hrs.

404 Plant Molecular Biology (4) Current research in plant molecular biology: techniques and procedures. Genome structure, gene expression and regulation, transformation, transposable elements, plant development. Labs: isolation of DNA and RNA, molecular hybridization, isolation and preparation of plasmids, PCR amplification of specific sequences, DNA sequencing and transformation. Prereq: Biodiversity; Organization and Function of the Cell and Genetics with grade of B or better and consent of instructor. 2 hrs and 4 labs.

412 Plant Anatomy (3) Cells, tissues and organs; development in vegetative and reproductive structures of vascular plants—seed plants. Prereq: General Botany or Biodiversity; Organization and Function of the Cell or equivalent.

419 Science as Method (3) (Same as Ecology and Evolutionary Biology 419 and Philosophy 419.)

431 Plant Ecology (4) Interactions between individuals, species, communities and their environments. Concepts of energy and matter in ecosystems. Weekly field trips or laboratory periods, and at least two weekend field trips. Prereq: Field Botany or equivalent. (Same as Ecology and Evolutionary Biology 431.) Sp

451 Plant Tissue Culture (3) Methods for culture of cells, tissues, and organs; media preparation and maintenance of cultures. Prereq: General Botany or Biodiversity; Organization and Function of the Cell or equivalent and General Chemistry or equivalent. Recom- mended prereq: Botany 412; Plants: Evolutionary Survey; Introduction to Plant Physiology; Introduction to Microbiology and Lab; Plant Propagation; and Field and Forage Crops.

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

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

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

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

510 Introduction to Electron Microscopy - Transmission Electron Microscopy (4) (Same as Biochemistry and Cellular and Molecular Biology 562.)

521-22 Advanced Plant Physiology I, II (3,3) 521- Plant biochemistry and metabolism; respiration, photosynthesis, carbon partitioning, and biosynthesis of specialized plant products: terpenoids, alkaloids, pheno- nolics and plant growth regulators. 522-Growth and differentiation of isolated plant cells, tissues, and organs at organismic levels. Hormonal regulation of develop- ment; macromolecular interpretation of differentiation, dormancy, germination, flowering and senescence. Prereq: Introduction to Biochemistry or Biochemistry and Cellular and Molecular Biology 410 and 1 semester of Introductory Plant Physiology or Cell Biology.

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

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

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

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

599 Advanced Evolutionary Ecology (3) Advanced concepts in evolutionary and ecological genetics. Biogeography, climate, population genetics, evolution and natural selection, population growth and regulation, competition, niche, experimental ecology, predation, phylogenetics in ecology, biodiversity and conserva- tion. Prereq: General Biology and General Ecology; one or more courses on organismal biology (ecology, evolution) at the upper undergraduate level or consent of instructor. Students cannot receive credit for both 499 and 599. (Same as Ecology and Evolutionary Biology 599.) Sp, A

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

606-07 Advanced Topics in Botanical Sciences (1-3, 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.

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

Broadcasting

(College of Communications)

MAJOR DEGREES

Communications ......................... M.S., Ph.D.
Barbara A. Moore, Head

Professors:
Holt, Darrel W. (Emeritus), Ph.D. ....................... Northwestern
Howard, Herbert H. (Emeritus), Ph.D. .... Ohio
Moore, Barbara A., Ph.D. ..................... Ohio
Swan, Norman R., Ph.D. ......................... Michigan

Assistant Professors:
Bates, Benjamin J., Ph.D. ....................... Michigan
Kaye, Barbara, Ph.D. ................. Florida State
Luther, Catherine, Ph.D. ... Minnesota

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

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


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

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


550 International Broadcasting (3) Broadcasting systems in other countries. Analysis of international broadcasting organizations. Intercultural communica-
560 Radio & Television Law and Regulations (3)

570 Radio & Television Research (3)
Various techniques used by stations and consultants in broadcast research. Applied audience research. Deciding which method to use, interpreting results, and applying research to management decision making. Prereq: Communications 512 or 512, or consent of instructor. Sp

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

590 Advanced Radio & Television Management (3)
Financial management of broadcast operations: budgeting, financial planning, accounting, and related techniques. Theoretical perspectives in broadcast management, organization, and management of commercial and non-commercial operations from perspective of general manager. Prereq: 490. Sp

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

598 Internship (3)
Full-time (30-40 hrs per week) work experience in news, production, or management with non-university professional organization. Educational experience beyond that available at university. Final term paper. No retroactive credit for previous work experience. Prereq: Senior or graduate standing, completion of at least 15 hrs of broadcasting courses, GPA 3.0 or better, and consent of department head.

Business Administration
(College of Business Administration)

MAJOR DEGREES
Business Administration ...................... MBA, J.D.-MBA, M.S.-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. The full-time MBA is for students seeking a full-time, weekday program that follows the traditional academic calendar. The nature of this program precludes students from simultaneously working full-time outside of school. In addition to the regular full-time program, there are two full-time dual-degree programs: the J.D.-MBA with the College of Law and the M.S. in Business Administration with the College of Engineering. Descriptions of these dual-degree programs follow the description of the regular, full-time program.

For students who wish to continue working full-time while they earn their MBA degree, there are four programs within the executive track of the MBA. In these programs, students carry a full academic course load in addition to their full-time jobs.

Each of these programs serves a different group of students. Descriptions of the MBA programs in the executive track follow the description of the dual-degree programs.

To obtain an MBA application, contact the MBA Program Office, 527 Stokely Management Center, College of Business Administration, The University of Tennessee, Knoxville, TN 37996-0552, Tel: (865) 974-5033, Email: mba@utk.edu. The application may also be downloaded from the website at http://mba.bus.utk.edu. For the executive professional program, contact the Executive MBA Program Office, 704 Stokely Management Center, College of Business Administration, The University of Tennessee, Knoxville, TN 37996-0575, Tel: (865) 974-1660.

THE MBA PROGRAM

The full-time MBA program is designed for students with undergraduate degrees in a wide variety of fields, including the social and natural sciences, humanities, and professional fields such as engineering, business, agriculture, and architecture. In addition, most students in this program should have two or more years of work experience beyond their undergraduate degree(s). The MBA program is a 17-month program with students beginning in late July of each year and graduating in December of the following year. During the summer between the second and third semesters, students must complete an internship with a company using skills acquired during the first year of the MBA program.

The MBA program consists of a common core (32 hours) and a selection of concentration and elective courses (15 hours). The first-year core develops a general management foundation upon which specialization is developed in the concentration area. The objective of the 17-month program is to develop leaders able to enhance the success of their organizations. Specific emphasis is placed upon competency in the area of integrated value chain management. This managerial perspective acknowledges that an organization's success is strongly related to its ability to function effectively and efficiently within a larger network of allied businesses. Managers must understand how to integrate business functions within their organizations, as well as across the other organizations within their value chain. Integrated value chain management rests upon a foundation including: supply chain management, information management, resource management, and customer relationship management. In addition, students will pursue concentrations and careers in a variety of areas, including finance, logistics and transportation, marketing, and operations management.

Admission Requirements
Applications are accepted for fall semester only. The application deadline for fall semester is March 1. Applications by U.S. citizens and permanent residents received after March 1 will be considered as space allows. To be considered for admission, the applicant's file must be complete. A completed file includes the Application for Graduate Admission, transcripts of prior college work, the MBA program application, two completed applicant recommendation forms, and the Graduate Management Admission Test (GMAT) score report. The first items should reach the Office of Graduate Admissions one month before the MBA application deadline to allow for processing. Additional information is required by Graduate Admissions for international students.

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

Prerequisites
There are no specific course prerequisites for admission. However, undergraduate courses and work experience should demonstrate ability with both qualitative and quantitative work.

MBA Core

The MBA core (32 hours total) consists of: a 3-hour foundations course taken during the three weeks prior to the beginning of fall semester, a 15-hour core course and a 1-hour career development course taken in the first semester (Fall 1), a 9-hour internship course taken in the second semester (Spring 1), a 3-hour distance course taken during the internship (Summer), and a 1-hour capstone in the third semester (Fall 2). The topics introduced within these courses follow three major themes. These are referred to as "what every manager needs to know," and includes such functional topics as finance, strategy, decision tools, environmental analysis, and leadership skills development. The second theme focuses on functions involved in the flows of product, information, and finances within an integrated value chain, to include, but not limited to, operations management, logistics management, demand management, customer relationship management, supplier management and resource management. The third theme involves integrating the content of the other two themes using information technology. Throughout all three themes, significant emphasis is placed on learning the topics in an integrated fashion. Students will understand how various business functions are integrated within an organization, as well as how integration should occur across organizations within the context of a value chain.

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
Courses should be considered for their summer internships. However, these courses will be delivered in the latter part of the spring semester of the first year, after the MBA Program Office has been notified of the concentration areas. Requests for changes in concentration areas must be submitted for approval to the MBA Program Office. Among the 15 credit hours in the concentration/electives block, 9 credit hours must be taken in one of the following concentration areas. For specific courses required in concentration areas, see the appropriate field of instruction.

Finance

Operations Management

Marketing

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.

Concentration and Electives

A concentration area may be indicated on the MBA Program Application or this declaration may be deferred until after matriculation. In any event, selection should be made after the first semester and must be made after completion of the first year. Requests for changes in concentration area must be submitted for approval to the MBA Program Office.

The first course in each concentration is designed to provide a foundation upon which the concentration can be built. These courses will be delivered in the latter part of the spring semester of the first year, after the Spring core course has been completed. They are intended to prepare students for their summer internships. However, these courses should not be thought of as simply the first three hours in a nine-hour elective. Rather, these courses are self-contained, intensive introductions to a specialty area of business. Students will choose two of these courses in the spring semester, which will permit them flexibility for choosing concentrations in the second year of the program. Two additional courses in the concentration area will be taken in the second fall semester to meet the 9-hour requirement for a concentration.

Elective courses may be chosen from any 500-level courses in the College of Business. Courses outside the College of Business Administration as well as courses listed in the Graduate Catalog numbered below 500 may be included as an elective only with written permission via formal petition to the MBA Program Office.

Other Requirements

The Application for Admission to Candidacy must be approved by three faculty members in the student’s area of concentration and the Assistant Dean of the MBA Program. It should be submitted to the Graduate Student Services Office at least one full semester prior to the date the degree is conferred. (Admission to candidacy for the MBA degree must be submitted in the spring semester for graduation in the following fall semester.)

To qualify for the degree, the student must achieve a B average (3.0) or above in MBA core courses required in his/her program, a B average or higher in courses comprising the concentration area, and a B average or higher in the overall program.

The EXECUTIVE MBA PROGRAMS

Each of the four programs of the executive track is designed to serve the needs of a different student group. The programs share a common course structure of 36 credit hours of classroom learning (BA 551, 552, 553) and 9 credit hours of projects applied within the student’s business organization (BA 554, 555, and 563). Students carry a full, 15-credit-hour load each semester. In each program, all participants begin and complete the program together.

The courses are functionally integrated, and the broad curriculum objectives are similar in each of the executive track programs. All are oriented toward applied learning and are highly interactive, making extensive use of experiential learning techniques. Emphasis and depth of subject material within the curriculum varies somewhat from program to program depending on the intended student group. All programs result in the same Master of Business Administration degree as the full-time MBA.

Admissions Criteria: Primary consideration is given to the applicant’s professional achievements and recommendations from the applicant’s organization. Applicants must meet the minimum requirements of the Graduate Council and submit transcripts of all undergraduate and graduate work. Applicants may need to take the Graduate Management Admission Test (GMAT) (or specific program descriptions). No specific cut-off score exists for either grade-point averages or GMAT scores; however, admission is competitive, and applicants will be evaluated on their ability to operate on a par with other high achieving participants. Students whose native language is not English must take the Test of English as a Foreign Language (TOEFL) unless they are U.S. citizens or have earned a degree from an accredited U.S. college or university within the past two years. A minimum TOEFL score of 213 on the computer-based test is required for admission to graduate study.

Prerequisites: Although there are no specific course prerequisites for admission, undergraduate studies and professional experience should demonstrate ability with both qualitative and quantitative work.

Transfer Credits: Because of the integrated nature of the executive track curricula, no credit hours may be transferred as substitutes for program curriculum.

Other Requirements: Other requirements are the same as those for the full-time MBA program.

Professional MBA Program

The weekend professional MBA is provided for fully-employed managers within commuting distance of the University of Tennessee. The group of students for whom this program is designed has approximately five years of work experience. The emphasis in this program is to provide a good grounding in the quantitative and qualitative tools of various business functions and a good basis in strategic thinking. Learning is expanded through applying these tools within the student's own organization through a structured project each semester. The professional MBA is the right choice for individuals who wish to enhance their position within their organization by broadening their business knowledge beyond the functional area in which they are currently employed.

The professional program is three consecutive semesters completed in 16 months. Classes meet all day on Saturdays and occasionally on Friday evening and/or Sunday afternoon. The program begins in August with an intensive three-week course. The final fall semester then includes an intensive week of courses in addition to weekend classes. Graduation is in December.

Applications are accepted for fall semester only. The application priority deadline is April 10.

Additional information on the professional MBA can be found at www.promba.utk.edu.

Executive MBA Program

The executive MBA is provided for a national audience of managers holding middle and upper level positions in organizations that support their attainment of an MBA degree. The students for whom this program is designed have at least 10 years of work experience and are currently in management positions. Typical students bring a greater knowledge of business fundamentals than is true of other MBA programs. The executive MBA places considerable emphasis on global business and on individual skills of leadership. The executive MBA also has a heavy emphasis on strategic thinking and leading-edge management concepts. The executive MBA is the right choice for individuals who are in positions of broad responsibility or who have been designated to fulfill such roles within their organizations in the future.

The executive MBA is three consecutive semesters completed in 12 months. The class meets in Knoxville for 11-day residency periods in alternate months starting in January and ending in December. The May residence period is a global business seminar of two weeks and is held in South America, Asia or Europe. Off-campus work includes synchronous distance learning classes and requires substantial and regular contact with faculty and other participants. The project work in the executive MBA is a large-scale management project running throughout the year. Typical students work as individual managers in their own organizations to choose a project of significant scale and scope. Each student project has a faculty advisor.

Applications are accepted for January entry only. The early application deadline is June 1, and the final application deadline is September 15. The GMAT may be waived...
Taiwan Executive MBA

The Taiwan executive MBA is provided for a national audience of physicians. The students for whom this program is designed have an M.D. or D.O. degree with five or more years of work experience. The curriculum objectives are the same as those for the executive MBA, but in the physician executive MBA, many of the functional skills are taught in the context of the health care industry, and there is specialized content related to the health care environment. The physician executive MBA is the right choice for physicians who wish to have a voice in the health care industry and in their own careers and are seeking a program that allows them to continue their practice while earning their MBA degree.

The physician executive MBA is three consecutive semesters completed in 12 months. The class meets in Knoxville for 8-day residence periods in January, April, August and December. Between residence periods, synchronous distance learning classes are held each Saturday morning, and there are asynchronous internet learning sessions each week.

Applications are accepted for January entry only. Applications are accepted throughout the year. The final application deadline is November 1. Applicants to the physician executive MBA are not required to take the GMAT test.

Additional information on the physician EMBA can be found at www.pembा.utk.edu.

DUAL J.D.-MBA PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferment of both the Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student approximately 15 hours (one semester) over the time that would be required to earn both degrees independently.

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

Admission Requirements

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

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies are started prior to entry into the last 28 semester hours of J.D. coursework and prior to the third semester of the MBA program. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee. Upon receipt of the application, the Dual Program Committee will determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

Curriculum

A dual program candidate must satisfy the graduation requirements of each college.

Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as 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 6 semester hours of credit toward the MBA for performance in approved courses offered in the College of Law. The approval of courses is the responsibility of the Dual Program Committee and the student’s assigned advisor.

Students may begin their studies in either the J.D. or the MBA program, but may not enroll in MBA coursework while completing the first year of the law curriculum and may not enroll in J.D. coursework while completing the first year of the business curriculum. During the first year in the J.D. program, students register through the College of Law. During the first year in the MBA program, students register as graduate students. After the first two years, any term in which students take law courses or a mixture of law and graduate courses, they are classified and registered as law students. If taking only graduate courses, they are classified and registered as graduate students.

Approved Dual Credit

MBA courses in which the student has earned a B grade or higher and are to be counted toward the J.D. program must include 9 semester hours approved by the College of Law. The 6 hours of law courses in which the student has earned a 2.3 or C+ grade or higher and are to be counted toward the MBA must be selected from those approved by the Asst. Dean of the MBA Program.

DUAL M.S.-MBA PROGRAM

The College of Business Administration and the College of Engineering offer an integrated program leading to the conferment of the Master of Business Administration degree with a major in Business Administration (concentration in operations management) and the Master of Science degree with a major in Engineering (concentration in manufacturing systems engineering, product development and manufacturing), Industrial Engineering (concentration in manufacturing systems engineering, product development and manufacturing), or Mechanical Engineering (concentration in product development and manufacturing).

The Engineering Science program is intended to provide other engineering majors an opportunity to participate in this program with a flexible coursework plan based on their undergraduate degree.

The Industrial Engineering program is open to students with undergraduate engineering majors other than industrial engineering.

The establishment of the dual program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex...
body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes in design and manufacturing and a short product development cycle.

Admission Requirements

Applications are accepted for fall semester only. Applicants for the M.S.-MBA program must make separate application to, and be competitively and independently accepted by, Graduate Admissions for the Master of Business Administration degree program and the Master of Science degree program with a major in Engineering Science, Industrial Engineering, or Mechanical Engineering, and by the Dual Program Committee.

Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual M.S.-MBA program and the appropriate engineering major (refer to the MBA program for separate instructions). Students accepted for both the MBA and one of the engineering degree programs will be assigned to Dual Program Committee advisors, who will be responsible for course approval and supervision of the students' progress through the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by Graduate Admissions for international students.

Curriculum

All engineering students enrolled in the dual program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum consists of 33 hours of common coursework in the College of Business Administration and 15 hours of common coursework in the College of Engineering. Engineering common coursework includes a culminating 3-hour integrated project course requiring a comprehensive report, and a final examination as required by the Dual Program Committee, to be taken during the first session of summer following the second year.

During the second year dual degree candidates will take courses in their engineering major. The coursework for each option is designed to provide students with a concentration in their major and advanced skills to accomplish their teamwork assignments.

Dual degree candidates enrolled in Engineering Science option are required to take 18 hours of graduate level engineering courses during the second year of the program. This option requires a coursework plan, approved by the Dual Program Committee, including a concentration such that the student can accomplish his/her teamwork assignments.

Curriculum for Dual M.S.-MBA Degree

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<th>Summer</th>
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<td>BA 511 MBA Core I</td>
<td>BA 512 MBA Core II</td>
<td>IE/ME504 Product Development Process 1</td>
<td>BA 513 MBA Core III</td>
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<td>IE 511* Business Planning and Commercialization</td>
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<td>IE/ME509 Project Management</td>
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<td>MBA “hub” course elective</td>
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<td>Summer (first session)</td>
<td>IE/ME594 Culminating Integrated Project Report</td>
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*Students in manufacturing systems engineering concentration may substitute other selected IE courses for these courses.

For additional requirements for Master of Science degree with majors in Engineering Science, Industrial Engineering, or Mechanical Engineering, refer to program descriptions for those majors.

- The dual degree candidate must satisfy the curriculum and graduation requirements of the engineering major being pursued and the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The M.S. and the MBA degrees will be awarded upon successful completion of the requirements of the dual program.

Approval Dual Credit

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

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 Office of Graduate Admissions. 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 Council requires the Graduate Admissions Application, transcripts from all previous college work, and additional information from international students. The college requires the Ph.D. application, scores from the GMAT, and four written recommendations. All materials should be received by the College of Business Administration not later than March 1. Late applications are considered only if space is available.

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

Program of Study

The Ph.D. normally requires four 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 and fourth years require completion of courses, the comprehensive exam, and completion of the dissertation. It is emphasized that the Ph.D. program of study is structured for full-time students only. Upon acceptance of a student by a particular departmental faculty, the student is expected to remain in residence until the dissertation has been completed and all requirements are met for completion of the Ph.D.

Since the program focuses on the development of competent scholars, heavy emphasis is placed on both teaching and research skills. As part of the doctoral program, each student is required to serve as a teaching assistant to an undergraduate business class or as a research assistant to a senior faculty member. Students with strong teaching skills may be assigned their own classes. 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 six concentrations offered in the Ph.D. program:

- Accounting
- Finance
- Logistics and Transportation Management
- Operations Management and Strategic Management
- Marketing
- Statistics

More detailed information concerning these specific areas is available by writing directly to each department or by accessing the College of Business Administration web page.

Degree Requirements

Doctoral students must file a program of study that has been approved by their doctoral committee within one year of
Doctoral Committee

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

Admission to Candidacy

Students may apply for admission to candidacy for the Ph.D. after maintaining at least a "B" average 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 is a graduation in the following spring semester.)

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

Admission to Candidacy

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

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state basis. The Ph.D. in Business Administration is available to residents of Alabama, Florida, Kentucky, or West Virginia; the MBA is available to residents of Alabama, Florida, Kentucky, Louisiana, Texas, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

ACADEMIC STANDARDS

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

Business Administration

GRADUATE COURSES

501 MBA Career Development (1) Career opportunities available each term. Prereq: Admission to MBA program or consent of Assistant Dean of MBA Program.

506 Enterprise Process Redesign (3) Enterprise Resource Planning (ERP) software as primary tool for redesigning business processes. Management methods required to facilitate redesign. Change management, consensus management, project management, and implementation methodologies. Configuration of ERP module and business-to-business e-commerce tools. (Same as Information Management 501.)

510 Customer Responsive Management (3) Manage- ment methods that provide flexibility required to respond to diverse customer needs and to adapt to competitive, technological, and operational change. Mass customization, interactive marketing, capacity management economics, and relationship manage- ment for industries; health care, consulting, temporary services, professional services, repair services, truck load transportation, emergency response organizations, customer service centers and other responsive organizations.

511 MBA Core I (3) Essential skills of manager: basic information technology skills, teambuilding, and written and oral communication skills. Finance and ac- counting fundamentals, computer literacy, introduction to integrated value chain. Prereq: Admission to MBA program or consent of Assistant Dean of MBA Program. S/N only.

512 MBA Core II (15) Development of roles and responsibilities of business managers. Functional fundamentals: marketing, operations, human resource management. Continuous systems improvement and delivery of customer value. Role of firm in society: stakeholder value, economics, and ethical and legal environment of firm. Personal leadership skills, and assessment of students’ leadership abilities. Integration of value chain: demand management, operations management, process design and management, and logistics management. Prereq: 511 or consent of Assistant Dean of MBA Program.

513 MBA Core III (9) Continuation of the functional fundamentals from 512. Integration of value chain: supply management and resource management. Capstone integrated experience using information technology. Prereq: Satisfactory completion of 512 or consent of Assistant Dean of MBA Program.

514 Integrated Business Simulation (3) Computer simulation. Teams manage business within competitive marketplace. Prereq: 511, 512, and 513 or consent of Assistant Dean of MBA Program.


551 Executive Core I (12) Integrated course with substantial reading, study and analyses during off-site periods. Integration of business functions through strategic and business process perspective. Application of functional knowledge to tactical and strategic issues. Development of purpose of firm as delivering value to customers and other stakeholders. Ethical issues. Financial and accounting principles. Economic and regulatory environment of business. Human re-source and organizational behavior topics in context of business systems and objectives. Personal development for leadership: individual personal skills of...
communication, negotiation, leadership and motivation. Customer value and systems management. Case simulations and exercises. Prereq: Admission to executive program of MBA.


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.


593 Directed Independent Study (3) Cross-disciplinary topic of mutual interest to student and faculty. Available only by prearrangement with supervising faculty member. May require approval of Dean of the MBA Program. May be repeated. Maximum 6 hrs. S/NC or letter grade.

599 Executive-In-Residence (3) Interaction with corporate executives from wide spectrum of business, management information systems.

601 Seminar in Theoretical Foundations (3) Theoretical foundations and frameworks common to business research. Historical and philosophical science perspectives.

612 Seminar in Research Methods (3) Research processes: philosophical foundations, problem formulation, grounded theory, qualitative methods and analysis, measurement, sources of error, experimental design and analysis, survey design and analysis.

699 Special Topics (3) Seminars that integrate content from various business functions: international business, management information systems.

Chemical Engineering

(College of Engineering)

MAJOR DEGREES

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

John R. Collier, Head

Professors:

Bienkowski, Paul R., Ph.D. ............... Purdue
Collier, John R., Ph.D. ............... Case Western
Counce, Robert M., Ph.D. ............... Tennessee
Cummings, Peter T., (Distinguished Scientist), Ph.D. .......... Melbourne
Frazier, George C., Jr. (Emeritus), D.Eng. ..................... Johns Hopkins
Moore, Charles F. (Alumni Prof.), Ph.D. ......................... Louisiana State
Sheth, Atul C. (UTSI), Ph.D. .......... Northwestern

Associate Professors:

Bruns, Duane D., Ph.D. ............... Houston
Chialvo, Ariel (Research), Ph.D. .......... Clemson
Cui, Sheng (Research), Ph.D. .......... Virginia
Ketman, Michael, Ph.D. ............... Iasi Tech

Assistant Professors:

Edward, Brian J., Ph.D. ............... Delaware
Frymier, Paul D. (Liaison), Ph.D. .... Virginia
Keffler, David J., 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, chemical bioengineering, advanced control systems, and polymer science and engineering.

THE MASTER'S PROGRAM

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

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

Departmental requirements consist of the satisfactory completion of:

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

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

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

CERTIFICATE IN MAINTENANCE AND RELIABILITY ENGINEERING

The College of Engineering offers a certificate program in maintenance and reliability engineering. The program is designed primarily for part-time students in that several of the courses are available through distance education.

The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses.
chemistry 75
courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Chemical Engineering 561, Industrial Engineering 516 and 591, Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student's personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council.

GRADUATE COURSES


467 Honors: Engineering Internship in Process Control (3) Students work in small groups on industrial problems in process dynamics and control. Directed by faculty and engineers from host company. Prereq: Process Dynamics and Control and consent of instructor.

477 Honors: Applied Process Automation Laboratory (3) Interfacing flexible batch continuous processes to automation systems. Top down analysis with bottom up implementation, hierarchical structures and object oriented concepts used to design automation solutions: human-machine-interfaces. Workstations with modern industrial equipment, interactive graphics and visualization environment. Prereq: Process Dynamics and Control and consent of instructor.

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

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

485 Hydrocarbon Processing (3) Chemical and physical properties of selected petrochemicals and those processes utilized in the 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/NC only. F

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

505 Engineering Analysis (3) Formulation and solution of problems in chemical engineering and materials areas, ordinary and partial differential equations; types of problems solved and solution techniques; application of numerical methods to solution of problems in chemical engineering and materials areas.

507 Application of Linear Algebra in Engineering Systems (3) Fundamental concepts of linear algebra and its applications to problems in engineering systems: steady state and dynamic systems. Geometric and physical interpretations of relevant concepts: least square problems, LU, QR, and SVD decompositions of system matrices; eigenvalue problems and similarity transformations in solving difference and differential equations; numerical stability of algorithms and various algorithms; application of linear algebra concepts in control and optimization studies; introduction to linear programming. Computer projects. Prereq: Graduate standing or consent of instructor. (Same as Electrical and Computer Engineering 507, Materials Science and Engineering 507, and Mechanical Engineering 507.)

531 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solution; composition relationship between phases, solution theories, and applications to macromolecular systems; introduction to microscopic approach to thermodynamics.


541 Polymer Rheology (3) (Same as Materials Science and Engineering.)

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

547 Transport Phenomena (3) Unified treatment of momentum transport (fluid flow), energy transport (heat conduction, convection, and radiation) and mass transport (diffusion). Fundamental basis of transport phenomena and momentum transport: viscous, inviscid, and potential flows.

548 Transport Phenomena II (3) Unified treatment of momentum and transport (fluid flow), energy transport (heat conduction, convection, and radiation) and mass transport (diffusion). Energy transport and mass transport in porous and energy systems, interaction between transport processes, and prediction of transport parameters.

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


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 transport (fluid flow for systems, biosensors, and immobilization methods. Fundamental laboratory techniques during 6-week laboratory period. (Same as Environmental Engineering 575 and Microbiology 575.)


581 Industrial Pollution Prevention (3) Principles and practical aspects of industrial waste minimization. Regulatory environment, waste minimization strategies, economic analysis, process safety, case study: analysis of waste minimization regulations and implementation in engineering practices. Prereq: Graduate standing in engineering or consent of instructor. (Same as Environmental Engineering 581 and Engineering Science 585.)

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

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

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

631 Advanced Topics in Statistical Thermodynamics and Molecular Dynamics (3) Statistical thermodynamics, molecular based computer simulations, Monte Carlo and molecular dynamics calculations; applications to supercritical fluids, macromolecules and biological systems. Prereq: 532.


642 Advanced Topics in Polymer Processing (3) (Same as Materials Science and Engineering 642.)

647 Advanced Transport Phenomena (3) Theory of mass, momentum, and energy transport in reactive and nonreactive systems. Formulation of transport models useful for application to analysis and design of separation processes, and chemical and biochemical reactors. Prereq: 565, 547.


661 Advanced Topics in Process Dynamics and Control (3) May be repeated. Maximum 6 hrs.

675 Microbial Systems Analysis (3) Identification and analysis of complex microbial systems using perturbation-response methods. Structuring of important mechanistic processes, interactions, and regulation at several systems levels (reactor or macro, ecological, cellular/physiological and molecular). Experimental methods for data gathering, signal resolution and processing, mathematical signal analysis, model development (deterministic, stochastic, phenomenological), and utility and limitations of approach. Prereq: 575 or consent of instructor.

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

Chemistry (College of Arts and Sciences)

MAJOR

DEGREES

Chemistry ................................................. M.S., Ph.D.

Michael Sepaniak, Head

Professors:

Adcock, J. L., Ph.D. ............................................ Texas

Alexandratos, S. D. (Hoechst-Celanese) Prof. of Polymer Science, Ph.D. California

Baker, D. C. (Paul and Wilma Ziegler Prof.), Ph.D. ................................................ Ohio State

Barnes, C. E., Ph.D. ........................................... Stanford

Bartmess, J. E., Ph.D. ........................................... Northwestern

Boor, J. E. (Emeritus), Ph.D. ......................... Manchester

Bull, W. E. (Emeritus), Ph.D. ............................... Illinois

Chambers, J. Q., Ph.D. ............................... Kansas

Compton, R. N., Ph.D. ........................................... Tennessee

Cook, K. D., Ph.D. ........................................... Wisconsin

Eastham, J. F. (Emeritus), Ph.D. .................................. California

Feigler, C. S., Ph.D. ........................................... Colorado

Fletcher, W. H. (Emeritus), Ph.D. .................. Minnesota

Grimm, F. A. (Emeritus), Ph.D. ..................... Cornell

Guiochon, G. (Distinguished Scientist), Ph.D. ................................ Washington

Kabalka, G. W. (Robert H. Cole Prof.), Ph.D. .......................................................... Distinguished Prof., Ph.D. Purdue

Klein, D. C. (Emeritus), Ph.D. .................. Princeton

Kovac, J. D., Ph.D. ........................................... Yale

Larese, J. Z., Ph.D. ........................................... Wesleyan (Connecticut)

Lietzke, M. H. (Emeritus), Ph.D. ..................... Wisconsin

Magid, L. J., Ph.D. ............................................ Tennessee

Magid, R. M., Ph.D. ........................................... Yale

Mays, J. W. (Distinguished Prof.), Ph.D. ....... Wisconsin

Magid, L. J., Ph.D. ............................................ California

Schweitzer, G. K. (Distinguished Prof.), Ph.D. .......................................................... Illinois

VanSia, M. J., Ph.D. ........................................... Iowa State

Welch, A. W. (Paul and Wilma Ziegler Prof.), Ph.D. ........................................... Johns Hopkins
Students majoring in Chemistry for the master’s or doctoral degree are required to present as a prerequisite one year each of general, analytical, and physical chemistry with a satisfactory record. At least one-half year of inorganic chemistry is also recommended. Students lacking any of these prerequisites may be admitted with appropriate deficiencies that must be removed without graduate credit. Applicants are required to take the general Graduate Record Examination.

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

### THE MASTER’S PROGRAM

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

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

1. Research and a thesis on the major department.
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. Sufficient graduate coursework in chemistry (at the 400 level or above) and/or a related field to make an overall total of 30 hours, including one of the following sequences: 510-11-12, 530-31-32, 550-51-52, 570-72-73, 590-94-95. At least 14 hours of this graduate coursework must be at the 500 level or above.
5. A final oral examination.

### THE DOCTORAL PROGRAM

The department offers concentrations in eight areas for the Ph.D.: analytical chemistry, chemical physics (in cooperation with the Department of Physics), environmental chemistry, inorganic chemistry, organic chemistry, 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 601.
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 with concentration in chemical physics is conducted jointly with the Department of Physics. Requirements consist of four courses on the major department.

### GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>430 Advanced Inorganic Chemistry</td>
<td>3</td>
<td>Atomic and molecular structure, bonding theories, descriptive chemistry of elements, kinetics and mechanism of inorganic reactions, applications of modern physical chemistry for characterization, coordination and organometallic chemistry. Prereq: 230 Inorganic Chemistry.</td>
</tr>
<tr>
<td>471-81 Biophysical Chemistry and Cellular Molecular Biology</td>
<td>3</td>
<td>(Same as Biochemistry and Cellular Molecular Biology 471-81.)</td>
</tr>
<tr>
<td>473-83 Physical Chemistry (3, 3)</td>
<td>Students may not receive credit for both 473 and 473 nor for both 481 and 483. 473 - Properties of gases; first, second and third laws of thermodynamics; chemical equilibrium; simple partial equilibria; properties of solutions. 483 - Introduction to statistical thermodynamics; kinetics of chemical reactions; introduction to quantum mechanics and applications to electronic structure of atoms and molecules; molecular spectroscopy. Prereq: General Chemistry, Elements of Physics or Fundamentals of Physics: Electricity and Magnetism, and Calculus III.</td>
<td></td>
</tr>
<tr>
<td>479-89 Physical Chemistry Laboratory (2, 2)</td>
<td></td>
<td>Experiments on topics discussed in 471-81 or 473-83. Prereq or coreq: Corresponding courses 471 or 473 or 479 and 481 or 483 for 489. 1 lab. 479-E, 489-Sp</td>
</tr>
<tr>
<td>500 Thesis (1-15)</td>
<td>P/NP only</td>
<td>E</td>
</tr>
<tr>
<td>501 Chemistry Seminar (1)</td>
<td>Lectures and discussion on current research. May be repeated. Continuous registration required for resident graduate students. Sic only.</td>
<td></td>
</tr>
<tr>
<td>502 Registration for Use of Facilities (1-15)</td>
<td>Requied for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.</td>
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<tr>
<td>503 Special Problems (3)</td>
<td>Specially assigned theoretical or experimental work on problems not covered in other courses. Prereq: Consent of department. May be repeated. Maximum 6 hrs. S/NC only.</td>
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</tr>
<tr>
<td>510 Analytical Spectrometry (3)</td>
<td>Principles and practice of optical and mass spectrometric techniques in quantitative chemical analysis. Pre req: background: Two semesters of physical chemistry.</td>
<td></td>
</tr>
<tr>
<td>511 Analytical Separations (3)</td>
<td>Principles and practice of chemical separations based on extraction, chromatographic, and electrophoretic phenomena. Pre req: background: Two semesters of physical chemistry.</td>
<td></td>
</tr>
<tr>
<td>512 Electroanalytical Chemistry (3)</td>
<td>Fundamentals of electrode processes; principles and practice of electroanalytical techniques in quantitative chemical analysis and applied to study of chemical systems. Required background: Two semesters of physical chemistry.</td>
<td></td>
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<tr>
<td>530 Chemical Bonding (3)</td>
<td>Wave mechanical atom, group theory, quantum approach to molecular orbital theory, covalent, ionic, and metallic bonding, ligand field theories, solid state. Required background: One semester of inorganic chemistry.</td>
<td></td>
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<tr>
<td>531 Characteristics of Inorganic Compounds (3)</td>
<td>Descriptive chemistry of elements; structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordination, organometallic, bioinorganic compounds. Required background: One semester of inorganic chemistry.</td>
<td></td>
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<tr>
<td>555 Organic Reaction Mechanisms (3)</td>
<td>Techniques and principles in study of organic reaction mechanisms; applications and interpretations in polar, pericyclic reactions; reactive intermediates. Prereq: 550.</td>
<td></td>
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<tr>
<td>556 Organic Spectroscopy Laboratory (1)</td>
<td>Use of IR, UV, MS and multinuclear FTNMR spectrometers. Development of problem-solving ability in area of spectroscopic characterization of organic molecules. Pre req: 360 or equivalent. Coreq: 553.</td>
<td></td>
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<tr>
<td>560 Quantum Chemistry and Spectroscopy (3)</td>
<td>Basic principles of quantum mechanics and their applications to molecular orbital theory, molecular structure, and spectroscopy; introduction to group theory. Required background: Two semesters of physical chemistry.</td>
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<tr>
<td>571 Advanced Quantum Chemistry and Spectroscopy (3)</td>
<td>Prereq: 570 or equivalent.</td>
<td></td>
</tr>
<tr>
<td>572 Thermodynamics and Statistical Mechanics (2)</td>
<td>Macroscopic and microscopic description of equilibrium systems. Basic principles of thermodynamics and statistical mechanics, and application to selected chemical systems. Required background: Two semesters of physical chemistry.</td>
<td></td>
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<tr>
<td>573 Chemical Kinetics and Transport (3)</td>
<td>Time-dependent phenomena in chemistry: chemical kinetics, chemical dynamics, transport theory. Required background: Two semesters of physical chemistry.</td>
<td></td>
</tr>
<tr>
<td>590 Polymer Chemistry (3)</td>
<td>Fundamentals of polymer synthesis and characterization through application of organic and physical chemical principles. Required background:</td>
<td></td>
</tr>
</tbody>
</table>
Child and Family Studies

(College of Human Ecology)

MAJORS

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

Gary W. Peterson, Head

Professors:
Blanton, Priscilla, Ed.D. ................. Tennessee
Buehler, Cheryl, Ph.D. ................. Minnesota
Cunningham, Jo Lynn, Ph.D. .... Michigan State
Fox, Greer Litton, Ph.D. ................. Michigan
Moran, James D., Ph.D. .............. Oklahoma State
Nordquist, V. Mick, Ph.D. ............ Tennessee
Peterson, Gary W., Ph.D. ............. Brigham Young
Steele, Connie (Emeritus), Ed.D. .... Texas Tech
Twardozs, Sandra, Ph.D. ............ Kansas

Associate Professors:
Allen, Jan, Ph.D. ......................... Purdue
Barber, Brian K., Ph.D. ............... Brigham Young
Malia, Julia, Ph.D. ......................... Iowa State
Morris, Lane, Ph.D. ..................... Tennessee
Smith, Delores, Ph.D. .................. Oklahoma State
Tegano, Deborah, Ph.D. .............. Virginia Tech

Assistant Professors:
Brandon, Denise, Ph.D. .............. Tennessee
Devereaux, Matt, Ph.D. .............. Tennessee
Moran, Mary Jane, Ph.D. .... New Hampshire
Wass, Tara, Ph.D. ...................... Denver

The Department of Child and Family Studies provides coursework in human development and family studies. Integration of these areas creates a unique perspective for the study of individuals and families. Each graduate student’s program of study is carefully planned in conjunction with a faculty committee to establish a program consistent with program requirements and a student’s individual goals. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings.

ADMISSION REQUIREMENTS

A completed file for review includes a departmental application, Graduate Record Examination (GRE) scores for the general section, and completion of three Graduate Rating Forms by individuals who can attest to the applicant’s potential for graduate education. Forms may be obtained from the department.

Admission to the program is contingent upon faculty evaluation of GRE scores, undergraduate/graduate GPA, rating forms, work experience, and the match between student’s goals and department’s foci. Prerequisites for admission to the master’s program are 9 semester hours of upper division undergraduate social science. Prerequisites to the doctoral program are a master’s degree from a regionally accredited institution or equivalent, completion of the 18 hour core in the CFS master’s program (or appropriate substitutions), 3 hours of computation-based, graduate-level statistics, 3 hours of graduate-level research methods, and completion of a dissertation as part of the master’s degree. The department provides a remedial mechanism for doctoral students who have earned a master’s degree but have not met the other prerequisite requirements.

THE MASTER’S PROGRAM

The Master of Science degree with a major in Child and Family Studies provides a broad foundation in the understanding of how children develop and how families function in today’s society. Two concentrations are available in child and family studies or in early childhood education.

Child and Family Studies requires a minimum of 36 credits of coursework: 18 credits in core coursework and 18 credits in specialization. Core requirements are: 510, 511, 540, 550, 552, and 562. Students then choose either the thesis option (research) or the non-thesis option (practice; internship and comprehensive exam required). Students who plan to work with children and families in the community are best served by selecting the non-thesis option. The non-thesis option requires 39 hours of coursework. In addition to the core and specialization courses, CFS 570 is required.

Specializations within the practice option include: child and family life practice, family mediation, gerontology, child and family policy, families of children with disabilities, and child and family program administration. Each of these specializations includes 6 credits of specified relevant coursework and a supervised internship (564 and 565). Master’s students who have completed the child and family life practice specialization by taking an approved set of courses are eligible to make application for full or provisional designation as a Certified Family Life Educator (CFLE) through the National Council on Family Relations. Specific coursework within each specialization is on file in the Department of Child and Family Studies. Interested students should contact the Graduate Coordinator in Child and Family Studies.

Students seeking the M.S. with a major in Child and Family Studies must file a plan of study with the department head after 12 hours of graduate credit.

The early childhood education concentration is designed for students seeking initial teacher licensure in early childhood education (Pre-K through Grade 4). This program is based on an undergraduate degree in child development or equivalent coursework. A non-thesis option only is available. All students in the early childhood education licensure program must enroll in Human Ecology 574, 575, 591, and Child and Family Studies 569. Students select one course from 510, 511 or 512; three courses from 511, 520, 521, 522, 525, 530, 540, 590; 3 hours of 500-level statistical methods or interpretation of statistics or research methods (requirement may be met with 569); and written comprehensive examination (36 credits).

THE PH.D. CONCENTRATION

The department participates in the doctoral program with a major in Human Ecology, concentration in child and family studies. Two themes are highlighted: the integration of human development and family studies and concentration in a selected area of study. A doctoral program that is currently specialized and integrative in nature reflects the complexity of the disciplinary subject matter, provides a broader context to formulate theoretical questions, and broadens the empirical literature for addressing those questions.

Requirements include:
2. Completion of the doctoral core: 640, 634, 691 or 650.
5. Three credits of advanced statistics.
6. Minimum 3 credits in specialized research methods.
7. Selection of one of the following specializations: teaching in higher education (requires UT GTA seminar, 3 credits of college teaching methods, and one semester of supervised teaching experience);
administration in community services (requires 556 or 563, 521 or HRD 512 or SW 541, and one semester of an administrative apprenticeship); research emphasis (requires 6 additional credits in research methods or statistics).

8. Minimum of 96 credits in a cognate area.
10. Minimum of 96 credits beyond the bachelor’s degree.

GRADUATE COURSES

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

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

505 Development of Interpersonal and Supervision Skills (3) 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. Skills adapted for use among family members.

510 Theory in Human Development (3) Theoretical models of human development: cognitive, social learning, and ecological theory; analysis, synthesis, and discussion of contemporary relevance of models; application of theory to research, prevention, intervention, and education; critical reading and evaluation of player-based research on human development processes.

511 Survey of Research in Child Development (3) Survey of human development research from conception through adolescence. Classic and contemporary empirical studies of physical, cognitive, language, social, emotional, and moral development. Biological basis of development of cross-cultural perspectives.

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.

515 Children in Contemporary Society (3) Theory and research on environmental and developmental influences on family situations and educational environments for children from infancy through middle childhood. Implications for programs and policy.


540 Parent-Child Relations (3) Influence of parents on children, influence of children on parents, reciprocal interaction between parents and children, applications of systems models, impact of child abuse and divorce on children. Reduced to 6 hrs graduate-level child and family studies courses.


550 Theory and Research in Family Studies (3) Research in various major topics in family studies and application of theoretical models to understanding research.

552 Diversity in Children and Families (3) Diversity in families: factors that influence the development of physical, cognitive, and emotional/personal development in diverse families and family settings.


555 Children, Divorce and Remarriage (3) Children’s adaptation to and adjustment to transitions involved in parental divorce, single-parenthood, and remarriage.


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

565 Practicum in Human Development or Family Studies II (3) School and community programs concerned with education for human development and family living. Committee approved and supervised written project. S/NC only. E

566 Approaches to Family Intervention and Counseling (3) Various theoretical approaches for family intervention and counseling. Structural, strategic, experiential and social learning schools of practice. Effectiveness of intervention approaches and their impact on family functioning and communication. Prereq: 562. (Same as Counseling Education and Counseling Psychology 566.)

567 Family Violence (3) Theory and research on initiators, maintenance, and violent behaviors in intimate family contexts, and assessment of responses to violent family behaviors, perpetrators, victims, and family systems. Prereq: 550.

569 Action Research in Early Childhood Education (3) Approaches to action research for practitioners in early childhood and school settings. Prereq: Admission to early childhood education graduate concentration in College of Human Ecology.


571 Research Seminar (1) Presentation and critique of research projects. Prereq: Departmental major or consent of instructor. May be repeated. S/NC only. E

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

575 Professional Internship in Teaching (1-6) Intensive teaching and teaching-related experiences in professional settings in public schools. Enrollment limited to postbaccalaureate students in professional year. Prereq: Validity and acceptability, and program. May be repeated. Maximum 12 hrs. S/NC only. F.Sp

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

591 Clinical Studies (1-6) Group and individual semi- nars during full-time internship in family and consumer sciences; theory and evaluation of professional core competencies. Completion and presentation of portfolio and analysis of teaching project. Coreq: 575.

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

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

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

630 Advanced Developmental Processes (3) Sociocognitive, cognitive/language development during infancy and childhood; Normative and nonnormative development. Prereq: 510 and 511. May be repeated with different topics. Maximum 6 hrs.

631 Adolescent Development in Families (3) Normative and nonnormative adolescent development: physical, cognitive, moral, social, familial, sexual, and personal. Prereq: 510, 511. May be repeated with different topics. Maximum 6 hrs.

633 Survey Design and Analysis (3) (Same as Sociology 633.)

634 Advanced Survey of Family Theory and Research (3) Conceptualization, analysis, and critical assessment of pertinent conceptual and empirical literatures at advanced level for variety of contemporary family issues. Prereq: 570, master’s core. Required background: 6 hrs graduate-level statistics.

640 Advanced Theory in Human Development (3) Original conceptualizations and current theoretical perspectives influencing field of human development and empirical evaluations of these perspectives. Prereq: 550, 510, 511, or consent of instructor.

650 Advanced Qualitative Research Methods (3) Techniques and data analysis in qualitative research in human development and family studies. Use of methods: in-depth interviewing, participant observation, and case studies. Prereq: Communications 642 or Psychology 612.


670 Secondary Analysis of Survey Data (3) Applied seminar in secondary analysis of survey data. Identification of data archives, accessing data, evaluation, and analysis of social science survey data. Nationally recognized data sets as case study of human development and family studies; study of youth, or children. SPSS analytic software. Prereq: 570 or equivalent, Statistics 532 or 537 or equivalent.

691 Analytic Reasoning (3) Analysis of quantitative methods and measures used in human development and family studies, validity, reliability, and generalizability. Prereq: 570. Required background: 9 hrs graduate coursework in child and family studies, and 6 hrs graduate-level statistics.
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:
Bennett, R. M., PE, Ph.D. ................. Illinois
Burdette, E. G. (Fred N. Peebles Prof.), PE, Ph.D. ................. Illinois
Chatterjee, A., PE, Ph.D. .................. NC State
Davis, W. T., Ph.D. ....................... Tennessee
Deatherage, J. H., PE, Ph.D. .............. Arizona
Drumm, E. C., PE, Ph.D. ................. Oregon
Goodpasture, D. W., Ph.D. ............... Illinois
Grecco, W. L. (Emeritus), Ph.D. ........ Michigan State
Heathington, K. W. (Emeritus), Ph.D. ...... Northwestern
Humphreys, J. B. (Emeritus), Ph.D. ........ Texas A&M
Johnson, H. L. (Emeritus), M.S., Ph.D. ...... Tennessee
Miller, W. A. (Emeritus), PE, Ph.D. ......... Georgia Tech
Reed, G. D. (Liaison), PE, Ph.D. .......... Arkansas
Robinson, R. B. (Fisher Prof.), PE, Ph.D. ...... Iowa State
Tschantz, B. A. (Emeritus), Ph.D. ............ Sc.D.
urbaniak, T., Ph.D. ................. New Mexico State
wegmann, F. J., Ph.D. ............... Northwestern

Associate Professors:
Cox, C. D., Ph.D. ....................... Penn State
Han, L. D., Ph.D. ....................... California
Miller, T. L., PE, Ph.D. ................. Tennessee
Penumadu, D., Ph.D................. Georgia Tech
Richards, S. H., PE, Ph.D. ............. Tennessee
Robinson, K. G., Ph.D. ............... VPI

Assistant Professors:
Chu, K., Ph.D. ....................... California
Huang, B., Ph.D. ....................... Louisiana State

The Department of Civil & 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, waste management, and environmental risk assessment. For further information, visit the website at http://www.engr.utk.edu/civil/.

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 problems course will usually be a special course in one of the areas listed above that will be approved by the student's major professor.

Environmental Engineering

For a Major 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 requirements may be satisfied: Enginering Fundamentals 101, 102; Nuclear Engineering 203 or Mechanical Engineering 331; Basic Engineering 121, 131; Environmental Science and Mechanics 231; Statistics 251; Civil Engineering 390, 395, 380; Mathematics 141, 142, 231, 241; Chemistry 120, 130. In addition, these courses 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. A student may present 12 semester hours of thesis, including 3 hours of thesis credit.

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

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

Civil Engineering

GRADUATE COURSES

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

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities: application of various engineering principles and techniques to process of planning, locating and design of highway facilities; both geometric and pavement design. Prereq: 210, 251, 352.

452 Traffic Engineering (3) Characteristics of driver, vehicle, and roadway and their interrelationship; traffic studies; basic considerations of traffic circulation and control, lighting, capacity analysis, roadway safety analysis and design. Prereq: 210, 251, 352.

453 Airport/Railroad Planning and Design (3) Airport master planning and railroad engineering. Runway configuration, airfield capacity, geometrics and layout and design. Prereq: 210, 251, 352.

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

474 Reinforced Concrete Design (3) Design of continuous beams, slab floor, and columns with combined axial loads and bending moments and design for torsion. Prereq: Introduction to Structural Design.

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

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

495 Water Resources Development and Management (3) Principles of water resources project development and management. Institutional framework: water law, evaluation procedures for comparing and selecting among water resources development alternatives. Decision-making principles of engineering economics, benefit-cost analysis, and cost allocation methods; environmental impact assessment procedures; decisions using risk-based methods; computers in design and analysis. Prereq: Consent of instructor. 500 Thesis (1-15) P/NP only. E 502 Registration for Use of Facilities (1-15) Required for those students 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/C only. E 510 Urban Systems: Engineering and Management (3) Various urban systems usually under responsibility of city manager and/or city engineer: streets, lighting, water, sewer, public safety, public works. Institutional framework: finance, planning and public relations. Prereq: Graduate standing or consent of instructor.

521 Pavement Design (3) Empirical and theoretical based methods of pavement design and analysis, strengthening of existing pavements, institutional framework: finance, planning, and public relations. Prereq: 492, 493, 494, 495, 541 and 542.


533 Advanced Laboratory and Insitu Testing of Soil (3) Instruments for measurement of electrical signals, static and dynamic transducers, data acquisition and control, insitu measurement of stress, pore pressure, deformation, load deformation behavior (seismic methods, static methods), advanced laboratory shear strength and compressibility testing. Prereq: 330 and 340.

534 Geological Engineering (3) Influence of geological origin and history on engineering characteristics of rocks and soils; applications of geology in planning, design and construction of civil engineering projects. Prereq: Introduction to Soil Behavior 2 hrs and 1 lab.


537 Issues in Geotechnical Engineering (1-3) Special reading assignments, research presentations in geotechnical engineering. Prereq: Graduate standing or consent of instructor. May be repeated.


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

543 Construction Estimating (3) Project costs, estimating techniques, collection and analysis of construction data, and feasibility of design to cost. Prereq: Construction Methods and Equipment.

545 Traffic Engineering-Characteristics (3) Driver-vehicle-roadway system; traffic flow modeling; traffic operations; identification and correction of high-accident locations and system deficiencies. Prereq: 541 or 542.

553 Geometric Design and Layout of Roadways and Community Facilities (3) Functional and geometric design and urban roads of all classes: subdivision layout; configuration of urban roads of all classes; techniques for access control; freeway interchange design and design of intersections; and parking. Prereq: 451 or consent of instructor.

555 Public Transit Planning (3) Characteristics of transit modes—conventional and paratransit; operational design of transit services: route planning and scheduling; cost analysis; mode choice models; performance evaluation; transit surveys; organization and financing. Prereq: 554 or graduate standing.

556 Traffic Accident Reconstruction (3) Data collection and analysis as basis for accident prevention on control programs; accident hardware and design crash testing. Prereq: 452 or graduate standing.

557 Transportation Planning and Operations with Micro-Computer Applications (3) Transportation system management techniques and application of micro-computers to transportation actions. Prereq: 551 and 556.

558 Planning and Transportation (3) Preparation of transportation as elements of comprehensive development plans. Analysis of relationship between various transportation modes and between transportation and other community features. Use of planning process to establish existing travel patterns, modeling of demand, proposing system improvements; limit analysis; and preparation of safety factors and probability based design codes; Monte Carlo methods; constructed system reliability; evaluation of existing infrastructure. Prereq: 554 or 558.

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

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

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

571 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading: interaction between internal stresses and external loads; criteria for design and current specifications for design. Prereq: 471.

572 Fracture Analysis (3) Analysis of brittle fracture and fatigue. Prereq: 471.

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

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

576 Masonry Design (3) Clay and concrete masonry materials; unreinforced masonry design; reinforced masonry design; seismic behavior of masonry structures. Prereq: Introduction to Structural Design.

580 Risk Analysis in Civil and Environmental Engineering (3) Applications of probability theory and statistics in civil engineering: uncertainties, simulations, reliability; geotechnology, water resources, transportation, and environmental engineering. Prereq: Calculus II or consent of instructor.

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/N/C only.

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

600 Doctoral Research and Dissertation (1-15) Pr/NP only. E 631 Soil Dynamics (3) Introductory and advanced topics: vibrations of elementary systems, foundations subjected to repeated and impulse loading, wave propagation theory and applications, and site response to dynamic loading. Prereq: 435 Foundation Engineering.

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

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

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 slabs; limit analysis; behavior, analysis, and design of reinforced concrete slabs; yield-line theory, finite element solutions, and ACI Code Methods. Prereq: 574.

680 Reliability of Constructed Systems (3) Development of safety factors and probability based design codes; Monte Carlo methods; constructed system reliability; evaluation of existing infrastructures. Prereq: 554 or 558.

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/NC only. E

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

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

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

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

522 Floodplain and Urban Flood Management (3) Review of national, regional, and local flood problems; state of the art flood damage reduction alternatives: structural and non-structural; institutional responses; policies, programs, organizations, regulations, and legal aspects; floodplain hydrology and hydraulics, HECH-1, HECH-2: floodway encroachment, flood hazard zone and damage potential determinations; cast studies. Prereq: Hydraulics 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 erodable channels; erosion, transportation, and deposition of sediment by flowing water; erodable channel design; channel regime theory; common computer models. Prereq: Hydraulics.

525 Soil Erosion and Sediment Yield (3) Theory of soil erosion and sediment yield processes from disturbed land; methods and computer models for estimating erosion and sedimentation; soil erosion and sediment control theory and management practices. Local and state regulations. Prereq: Civil Engineering 395. (Same as Biosystems Engineering 520.)

530 Urban Hydrology and Stormwater Engineering (3) Planning, design, modeling, management, and maintenance of urban stormwater systems. Theory and application of hydraulic and hydrologic principles to design of stormwater management systems; design of inlet structures, conveyance systems, detention and retention basins and appurtenances, and selected best management practices (BMPs); evaluation of land-use changes of runoff quantity and quality; review, selection and application of contemporary computer models. Prereq: Hydraulics, Hydrology.

535 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.)

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

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

551 Physicochemical Unit Processes (3) Theory and design application in water and wastewater treatment. Prereq: Water and Waste Treatment, and Hydraulics.

552 Biological Treatment Theory (3) Theory and design applications of biological processes to treatment of wastewater and solid wastes. Prereq: Water and Waste Treatment, and Hydraulics. (Same as Biosystems Engineering 552.)

553 Aquatic Chemistry (3) Theoretical, applied, and analytical chemistry related to generated, measurement and treatment of environmental contaminants. Prereq: General Chemistry. 2 hrs and 1 lab.

554 Environmental Engineering Chemistry (3) Application of chemical and biochemical principles to the analysis of water, soil, and airborne pollutants. 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 analysis; industrial applications. Prereq: Graduate standing or consent of instructor.

557 Hazardous Waste Site Remediation (3) Advanced study of processes for hazardous waste site remediation: soil vapor extraction, soil washing, chemical destruction, thermal destruction, bioremediation. Prereq: 556 or consent of instructor.

570 Air Quality Management/Pollution Control (3) Introductory course on concepts of air pollution analysis, relationship among sources, myths, polices, programs, organizations, regulations, and legal aspects; air pollution dispersion models and 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) Diffusion 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 Biosystems Engineering 575.)

581 Industrial Pollution Prevention (3) (Same as Chemical Engineering 581 and Engineering Science 385.)

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

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

620 Advanced Surface Water Hydraulics (3) Advanced topics in surface water hydraulics; solutions in St. Venant equations of unsteady flow for complex channel situations; dam breach modeling. Prereq: 520.

651 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 553. Prereq or coreq: 552. 2 hrs and 1 lab.

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

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

Classics

(Commerce and Social Sciences)

David W. Tandy, Head

Professors:

Gesell, G. C. (Lindsay Young Prof.), Ph.D. ......................... North Carolina
Martin, S. D., Ph.D. ................................... Michigan
Rutledge, H. C. (Emeritus), Ph.D. ................................ Ohio State
Tandy, D. W. (Distinguished Prof.), Ph.D. ............. Yale

Associate Professors:

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

Assistant Professor:

Sutherland, E. H., Ph.D. ............... UC Berkeley

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

GRADUATE COURSES


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

414 Cicero and Techniques of Latin Prose Composition (3) For advanced students in Latin, practice in prose composition, writings of Cicero the model. Prereq: 351-52 or consent of instructor.

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

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

441 Special Topics in Classical Civilization (1-3) Art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hrs.

461 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in an existing course, or concentrating on one aspect of existing survey. Prereq: According to topic. May be repeated. Maximum 9 hrs.

561 Special Topics in Classical Civilization (1-3) Advanced tutorial work in Greek and Roman authors in English translation; problems in cultures of Greece and Rome. May be repeated. Maximum 9 hrs. Letter grade or S/NC.

562 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian and African prehistory. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
Communications
(College of Communications)

MAJOR DEGREES
Communications............................. M.S., Ph.D.

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

For application forms and other information about the M.S. and Ph.D. programs in Communications, write to: Associate Dean for Graduate Studies, College of Communications, 426 Communications Building, The University of Tennessee, Knoxville, TN 37996-0347.

ADMISSION REQUIREMENTS
Applicants must meet admission requirements of the Graduate Council. In addition, they must complete the Graduate Record Examination, rating forms, and application forms as required by the College of Communications. Minimum requirements for admission to full potential candidate status normally include a 3.0 (4.0 system) grade-point average in undergraduate studies and scores at or above the fiftieth percentile in verbal, quantitative and analytical aptitude on the Graduate Record Examination. All application materials are screened by an admissions committee authorized by the faculty of the College of Communications.

New students normally are admitted to the programs only at the beginning of fall semester. However, under special circumstances, a student may be admitted at the beginning of spring semester in a temporary non-degree status. Applications for fall admission must be received by May 1. Applications for financial aid are due by March 1.

A baccalaureate degree in communications or a related field is recommended. Admission is possible with other baccalaureate degrees. However, all applicants without the appropriate background are required to take up to 18 semester hours of prerequisite and corequisite courses as determined by the department in which the student is enrolled. Students may take a proficiency test on any prerequisite course, subject to review by the Graduate Studies Committee of the College of Communications.

Master’s students who have had no courses in their major area of concentration may expect to spend four or more full-time semesters in the program, including a media internship.

THE MASTER’S PROGRAM
The Master of Science with a major in Communications is intended for students who desire a career in the mass media and communications industry, with an emphasis on communications management and a deeper understanding of the communication process and social role of media. The program follows a broad-based multi-media approach while allowing the student to concentrate in one of five fields: advertising, broadcasting, journalism, public relations or speech communication. Both thesis and non-thesis options are available.

The prospective student who is interested only in acquiring basic skills in one of the areas listed above is advised to enroll for a second baccalaureate rather than an advanced degree.

Students planning to pursue a doctoral degree with a major in Communications may be accommodated in the M.S. program through special academic advising.

Degree Requirements
The M.S. program emphasizes communications management and industry in the areas of advertising, journalism (publications), public relations, and speech communication. For the thesis option, a minimum of 30 hours of approved graduate work is required. The non-thesis option requires 33 hours. Orientation attendance is required.

1. Six hours of core courses—Communications 512 and 540 to 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. Fifteen 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 for the thesis option and 9 hours for the non-thesis option of electives from a list provided by the department in area of concentration.
4. Six hours of thesis work (Communications 500) 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, Journalism 598, or Public Relations 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 pursue the thesis option and to take additional courses in communications theory and research, subject to advisor’s approval.

After completion of the formal program of 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. Orientation attendance is required.

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, and 3.5 for graduate work in a master’s degree.
2. At or above the fiftieth percentile in verbal, quantitative and analytical aptitude on the Graduate Record Examination;
3. Endorsement by at least three former teachers or professional colleagues; and a statement of applicant’s goals and reasons for pursuing the doctorate. Personal interviews with members of the Ph.D. Admissions Committee are recommended and may be required. Professional experience in some field of communications is a highly desirable criterion for admission.

A minimum of 87 hours of approved graduate work is required for the Ph.D.

1. Twenty-seven hours of core courses—Communications 612, 620, 640, 641; 6 hours of statistics; and three of the following courses: Communications 622, 632, 642, and 652.
2. Fifteen hours in a primary concentration (advertising, broadcasting, information sciences, journalism, public relations, or speech communication) supplementing the core. Courses may be taken in one or more of the Departments of Advertising, Broadcasting, Speech Communication, and/or the Schools of Information Sciences and Journalism.
3. Twelve hours in a secondary concentration (outside the College of Communications).
5. Twenty-four hours of dissertation. All courses require the approval of the student’s advising committee.

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

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

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

Planned course offerings in the College of Communications for a full calendar year are available the preceding November. This information is available from the Graduate Studies Office, 426 Communications Building, 974-6851. See also courses listed under Advertising, Broadcasting, Information
Sciences, Journalism, and Speech Communication.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S. program in Communications is available to residents of Arkansas or Kentucky. The Ph.D. program is available to residents of the states of Alabama, Arkansas, Louisiana, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

ACADEMIC STANDARDS

A student in the College of Communications whose graduate grade point average, not including incomplete grades, is below 3.0 at any time after the end of 12 hours of graduate credit will be placed on probation. A student on probation will be dropped from the program unless his or her cumulative graduate grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 semester hours of graduate coursework attempted that is specified in the student’s degree program. Exceptions to this policy may be made only with the approval of the Associate Dean for Graduate Studies of the College of Communications on the recommendation of the student’s faculty committee.

GRADUATE COURSES


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

508 Research (1-15) P/NP only. E

521 Tutorial in Communications Teaching (1) Experience as teacher under guidance of faculty mem- ber. Prereq: Consent of instructor. S/N/C only. E

540 Communications Theory (3) Selected research hypotheses and theories in literature of mass communications. Prereq: Consent of instructor or admission to program. S

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

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

552 Seminar in Health Communications (3) Methods, problems, and issues of communication in health field. Media’s reporting of health issues. Setting of media’s “health agenda”; strategic uses of media in social marketing efforts; public communication of complex social/medical issues. Prereq: Consent of instructor.

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


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

593 Seminar in Mass Communications Issues (3) Contemporary topics in communications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

597 Independent Study (1-3) 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

612 Fundamentals of Research (3) Universal research process from defining ideas and problems to reporting results. Causal inference and relative strengths of various research designs. Funda- mentals and specific applications of most common data-gathering and measurement techniques in commu- nications research: experimental, survey, content analysis, historical and qualitative. Prereq: Consent of instructor or admission to program. Sp

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

622 Quantitative Research (3) Techniques for evalua- tion of research design and measurement. Survey, content analysis, and experimental techniques. Asses- sment of reliability and validity. Data analysis, hypotheses testing, and inference strategies. Prereq: 612, F.

632 Mass Communications History and Historiogra- phy (3) Origins and development of mass media in America. Philosophies of history. Historical sources and their verifications. Synthesis and interpretation of data. Prereq: 612 or consent of instructor. Su

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

641 Mass Communications Theory II (3) Selected topics in theory. Critical evaluation of extant theory, derivation of hypotheses, and advanced theory con- struction. Prereq: 640. Sp

642 Qualitative Research (3) Theory and application of qualitative research methods to social science and communications research. Theoretical considerations underlying symbolic interactionism as translated into research strategies of participant observation, life history, interviewing, archival analysis, and case studies. Prereq: 612 or consent of instructor. Su

652 Mass Communications Law and Legal Re- search (3) Legal restrictions under which mass media operate. Finding, interpreting and analyzing sources of legal information. Prereq: 612 or consent of instructor. Sp

692 Advanced Topics in Communications Theory and Methodology (3) Advanced and methodological study of communica- tion issues, theories and methods. May use quantitative, qualitative, historical or legal approaches. May be repeated. Prereq: 622, 632, 642 or 652 or consent of instructor.

Comparative and Experimental Medicine

(Office of the Provost)

MAJOR DEGREES

Comparative and Experimental Medicine ............... M.S., Ph.D.

Robert N. Moore, Director

Joint Graduate Coordinating Committee:

Bartges, Joe, D.V.M., Ph.D., Veterinary Teaching Hospital
Karlstad, M.D., Ph.D., Anesthesiology
Lawler, J. E., Ph.D., Psychology
Lozzio, C., M.D., Medical Biology
Moore, Robert N. (Liaison), 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 experimental pathobiology, infectious diseases, pharmacokinetics, epidemiology, clinical medicine, immunopathology, hematology, aberrant metabolism, oncology, and genetic disorders. The Ph.D. program is open to approved graduate students seeking training in this area and is especially useful for individuals with professional degrees. For the student with undergraduate biological science background, the Comparative and Experimental Medicine program provides an unusual opportunity to study disease processes common in humans and animals from a multidisciplinary perspective. The scope of this intercollegiate program, which pools faculty resources from both veterinary and human medicine, is broadened by faculty members representing animal science and numerous areas of the life sciences. The interdisciplinary training environment includes such diverse support as facilities and personnel at the Veterinary Teaching Hospital, UT Medical Center at Knoxville, the Oak Ridge National Laboratory, Knoxville Zoological Park, Hemophilia Clinic, Develop- mental and Genetic Center, Hematology and Oncology services, and departments of life sciences.

For additional information, write to the Office of Research and Graduate Programs, or access the Website at http://

cem.vet.utk.edu.

ADMISSION REQUIREMENTS

Admission requirements of the Graduate Council of UT apply. In addition, all applicants must furnish three letters of recommendation from individuals who are familiar with their scholastic or professional records.

Master of Science Degree Program

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 whose background include no formal training in the biomedical field beyond the baccalaureate degree will be required to score at least 1,000 on the quantitative and verbal portions of the Graduate Record Examination.

**Doctor of Philosophy Degree Program**

Applicants generally will be expected to have a professional degree in one of the medical sciences (e.g., M.D., D.D.S., D.V.M) or a master’s degree in one of the biomedical sciences and a Graduate Record Examination score of at least 1000 for the quantitative and verbal sections.

An individual having a baccalaureate degree with a 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 may be admitted to the Comparative and Experimental Medicine graduate program but will be enrolled officially as veterinary students. During summers such students may take advantage of registering for graduate courses to be counted as elective courses in the veterinary program.

**THE MASTER'S PROGRAM**

Core courses are required for the program. A basic science and/or applied science concentration must be selected at the first meeting of the student's master's committee. For the basic science concentration, students must take at least 4 credit hours in 500- or 600-level courses in basic mechanisms of disease and at least 6 credit hours of 500-level biochemistry or cell biology. See listings under the Biochemistry and Cellular and Molecular Biology program for information on these courses. For the applied science concentration, students must take at least 6 credit hours of 600-level epidemiology and at least 5 credit hours of 500- or 600-level statistics. In addition, students must complete a minimum of 8 hours of coursework in a specified discipline. Exceptions to accommodate students with specific interests must be approved by the Joint Graduate Coordinating Committee after application, in writing, to the director. Areas of emphasis may include hematology, oncology, comparative pathology, comparative pharmacology, toxicology, immunology, genetics, infectious disease or biochemistry of diseases. At least 24 hours of coursework, including a minimum of 6 hours at the 600 level, and 24 hours of Dissertation 800 are required for a total of 48 hours. For students with professional degrees, a minimum of 18 hours of coursework beyond the professional degree is required for a total of 42 hours.

The doctoral committee (at least 4 members) is chosen during the first year. Three of the four members, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from the College of Veterinary Medicine and at least one member from the Graduate School of Medicine.

A comprehensive examination is given at the completion of coursework. A seminar and final oral defense of the dissertation culminate the program.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S. degree in Comparative and Experimental Medicine is available to residents of Georgia. The Ph.D. program is available to residents of the state of Florida. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

**Comparative and Experimental Medicine--Graduate School of Medicine**

**GRADUATE COURSES**

- Participating departments include: Anesthesiology, Comparative Medicine, Microbiology, Pathology, Large Animal Clinical Sciences, and Small Animal Clinical Sciences. Several faculty in the Department of Microbiology hold joint appointments in the College of Veterinary Medicine. See Microbiology under Fields of Instruction for additional courses.

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

**503 Predictive Toxicology (3)** Principles and techniques of predictive toxicity: structure-activity relationships, expert systems, neural nets and molecular similarity. SP, A

**506 Laboratory Animal Care and Use (2)** Review of basic laboratory animal care and use as prerequisite to conducting research using animal subjects. Compliance issues and techniques. F

**Comparative and Experimental Medicine--Veterinary Medicine**

**GRADUATE COURSES**

- Participating departments include: Animal Science, Comparative Medicine, Microbiology, Pathology, Large Animal Clinical Sciences, and Small Animal Clinical Sciences. Several faculty in the Department of Microbiology hold joint appointments in the College of Veterinary Medicine. See Microbiology under Fields of Instruction for additional courses.

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

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

**506 Experimental Animal Surgery (3)** Competence in performing humane surgical modifications of experimental animals. Techniques of anesthesia. Drug administration and postoperative care. Prereq: Embry-
MAJOR DEGREES

Computer Science

M.S., Ph.D.

Robert C. Ward, Head

Comparative Medicine

See College of Veterinary Medicine and Comparative and Experimental Medicine.

Computer Science

(College of Arts and Sciences)

THE DOCTORAL PROGRAM

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

1. The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student’s potential for advanced work in computer science (for example, college teachers or employers for whom the student has worked after earning a Bachelor’s degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.

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

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 UT. The student’s advisor and department 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 automata 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 (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
522 Cybernetics (3) Various functions in living systems and their actual or potential realization in computers. Prereq: Discrete Structures.
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.
530 Computer Systems Organization (3) Architectures and systems organization for serial and parallel machines. Required background: Architecture or machine organization.
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: Discrete Structures and probability or statistics.
552 Image Analysis (3) Enhancement and restoration of digital images. 2D transforms. Segmentation and description. Computational procedures for image reconstruction. Prereq: One year calculus and discrete structures.
560 Software Systems (3) Design and implementation of compilers, software systems; optimization, runtime storage administration. Software system design issues; description, structure and design of contemporary software systems. Prereq: Systems Programming.
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 linear systems: graph models, reordering techniques, symbolic factorization, data structures, numerical algorithms, complexity analyses, parallel algorithms. Prereq: Numerical linear algebra.
580 Foundations (3) Foundations of computer science, including computability, computational complexity, fundamental algorithms and algorithm analysis. Required background: Automata theory.
581 Advanced 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. Prereq: 580.
593 Independent Study (1-15) May be repeated. 
594 Special Topics in Computer Science (1-3) May be repeated.
600 Doctoral Research and Dissertation (2-15) Prereq: NP only. E
620 Advanced Topics in Intelligent Systems (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 Scientific Computing (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.

The Department of Consumer and Industry Services Management offers the master’s degree with majors in Textiles, Retailing and Consumer Sciences, concentrations in textile science and in retail algorithms, and in scientific computing, and in Recreation, Tourism and Hospitality Management, concentrations in therapeutic recreation, recreation administration, tourism, and hospitality management.

The programs in Consumer and Industry Services Management 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 areas related 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 Application for Admission file, Department of Consumer and Industry Services Management application, Graduate Record Examination (GRE) scores for the general section, and three Graduate 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 Council, admission to the master’s degree program with a major in Textiles, Retailing and Consumer Sciences is dependent on completion of undergraduate courses that give the necessary background for success in the graduate program. For the concentration in retail and consumer science, students should have an adequate background in retailing and/or consumer science supported by coursework in economics, marketing, mathematics, and statistics. For the concentration in textile science, students should have a basic technical background in textile science or materials science supported by mathematics through differential equations, organic chemistry, and general physics.

Superior students deficient in one or more of the above requirements, may be admitted at the discretion of the department’s graduate faculty.

THE MASTER’S PROGRAM

The requirements for the major in Textiles, Retailing and Consumer Sciences are listed below by concentration.

Retail and Consumer Sciences (Thesis) Services Management: Retail and Consumer Sciences 541, 538, Hotel and Restaurant Administration 532, Recreation and Tourism Management 510
Internship 3-6
Elective 3-6
Total 39

THE PH.D. CONCENTRATIONS

Retail and Consumer Sciences
Students enrolled in the Ph.D. program with a concentration in retail and consumer sciences are provided with a foundation in management and retail and consumer services industry. Further, they will have the application in advanced study and research. Requirements are either 81 or 90 hours, depending upon whether students select a minor in statistics. Requirements include:

RCS Required Courses: 614, 615, 625, 641, 651
Research Methods: 590, 616
Statistics 12-15
Cognate Area 9
Human Ecology 630
Electives 21
Dissertation 24
Total 83-89

Note: (1) Statistics hours must include Statistics 537, 538, 579. (2) Cognate hours must include at least 3 hours at the 600 level. (3) Students choosing to take a minor in statistics will take a minimum of 15 hours of prescribed statistics courses and are not required to take a cognate area.

Textile Science
Students enrolled in the Ph.D. program in Textile Science with a concentration in textile science take one course which provides a foundation for the integration of textiles and apparel in the context of the near environment. A required departmental research seminar exposes students to research being conducted in all areas of study in the department. Requirements include:

Textile Science Courses 18
TS 552 3
TS 590 2
Cognate Area 9
Statistics (500-600 level) 6
Research Methods* 6
Electives 14
Dissertation 24
Total 82

*Must include 6 hours of laboratory techniques in materials analysis and characterization.

Note: Students must take a minimum of 9 hours at the 600-level in the College of Human Ecology, exclusive of dissertation. Transfer students with a master’s degree from another institution are required to complete at least 42 hours (including dissertation hours) from UT.

CERTIFICATE IN SERVICES MANAGEMENT

The Department of Consumer and Industry Services Management offers a certificate program in services management for students seeking further education and career advancement opportunities in the services industry. The 12-credit hour certificate is available by completing the following courses: Retail and Consumer Sciences 541, 538, Hotel and Restaurant Administration 532, and Recreation and Tourism Management 510.
ACADEMIC STANDARDS
1. Evaluation of student progress will normally occur prior to enrollment for thesis hours (or the non-thesis option) and during the second semester of full time enrollment in the program. The review of the student will be undertaken by the faculty with consideration given to factors such as: GPA (minimum 3.0), portfolio evaluation, and demonstrated research capability.
2. If progress or performance is deemed insufficient, the faculty may recommend probation with specific goals set for a specified time or termination.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S. program in Recreation, Tourism, and Hospitality Management is available to residents of the state of Kentucky. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions. 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 (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
531 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 Human Resource Management in Services Industry (3) Analysis of significant organizational processes and practices in management of human resources within consumer product and service industry. E
534 Special Topics in Foodservice and Lodging Administration (1-3) Lecture/discussion format. Contemporary developments and trends in industry. Prereq: Consent of instructor. May be repeated. E
535 Directed Study in Foodservice and Lodging Administration (1-5) Problems selected for study by student with guidance of faculty member. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
537 Seminar in Foodservice and Lodging Administration (1-3) May be repeated. S/NC only. F
542 Advanced Hotel Administration (3) Strategic management of hotel organizations. Theoretical and applied literature on formulation and implementation of strategy: external and internal factors relevant for business and corporate level decisions. Consideration of role of marketing in hotel firms. Analysis of industry and case studies. Prereq: 531, 532. Sp,A
547 Field Experience (3-9) Experience in food- or lodging-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. S/NC only. E
555 Foodservice and Lodging Law (3) Management organization and policy as imposed or granted by law. Legal research to determine legal principles at state and federal levels which impact industry. Prereq: Hospital Law or equivalent, or consent of instructor. Sp,A
600 Doctoral Research and Dissertation (3-15) P/NP only. E

Recreation and Tourism Management

GRADUATE COURSES
415 Development and Maintenance of Recreation, Tourism and Athletic Facilities (3) Principles of planning, programming, and operation and management of various facilities. Elements of risk management and safety in design process. Prereq: 310 Development and Evaluation of Recreation and Tourism Programs or consent of instructor. (Same as Sport Management 415.) F
430 Organization and Administration of Leisure and Tourism Services (3) Principles of administration applied to provision of leisure services offered by public, private and/or commercial enterprises. Organizational structures, personnel management, evaluation, and authority, introduction to budgeting and fiscal procedures. Prereq: 310 or consent of instructor. F
440 Dimensions of Commercial Recreation and Tourism Enterprises (3) Organizational structures, delivery systems, financing private enterprises and operating selected profit centers in a variety of settings. Market performance and economic impact. Prereq: 110 Recreation Foundations of Leadership, junior standing or consent of instructor. Sp
450 Special Topics in Leisure Education and Tourism - (1-6) Development of special topics in recreation, therapeutic recreation and tourism. May be repeated. Maximum 6 hrs. E
470 Tourism and Leisure Industries (3) Symbiotic relationship between tourism and various sectors of leisure industry. Use of resources, both natural and developed, and economic impacts of ventures. Socio-cultural impacts on venues as well as venues impact on local population. Sp
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
510 Trends and Issues in Services Management (3) Examination of current and emerging trends and issues in consumer product and service industries. Implications of trends and their managerial and strategic applications in services management. F
515 Philosophical and Conceptual Foundations of Leisure (3) Philosophy of leisure and recreation: nature of philosophy, concepts of leisure, recreation, play, work, and other factors, history of field, and relationship of ideas to contemporary society and to professional practice. F
520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of the therapeutic recreation, basic overview of aspects of leisure delivery systems. Prereq: Consent of instructor. F
521 Facilitation Techniques in Therapeutic Recreation (3) Role of therapeutic recreation in clinical and non-clinical settings: application of life-style 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
540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generating strategies, cash and inventory control, commercial/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 strategic design of recreation and sport related facilities. Prereq: Consent of instructor. Su
590 Graduate Internship (3-6) Required of all graduate students. Minimum 50 clock hrs for each hour credit. Work experience, evaluation by agency and university and written paper required. E
591 Directed Study in Leisure & Recreation (1-6) Detailed study of theme, issue, or concern. Designed to meet needs of individual students. May be repeated. Maximum 6 hrs. E
592 Special Topics in Recreation & Leisure Studies (1-6) May be repeated. Maximum 6 hrs. E

Retail and Consumer Sciences

GRADUATE COURSES
411 Entrepreneurship and Small Business Management (3) Concepts of entrepreneurship within single ownership and other business organizations; risk-taking and risk management; management of small business; current issues and problems. Prereq: Marketing 301 Principles of Marketing, Accounting 202 Principles of Managerial Accounting.
412 Direct Retail Methods (3) Use of direct selling methods to sell goods and services. Analysis of consumers and product/service type for integrated direct retail methods. Direct mail, catalogs, telemarketing, infomercials, and electronic commerce (internet). Prereq: 376 Strategies for Growth.
415 Retail Promotion (3) In-store promotional activities; development of retail promotion strategies; evaluation of retail promotions; supplementary focus on advertising and other methods to communicate in-store promotions. Prereq: 376 Strategies for Growth.
450 Economics of Consumer Choice (3) Micro and macro economic approaches to consumer choice across life span; demographics; economic status of consumers; demand analysis; market structure and its impact on consumers; economics of information, implications on private and public sectors. Required background: Introductory economics.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
Textile Science

GRADUATE COURSES

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

501 Professional Project (3-6) Application-oriented, capstone project to show competence in major academic area. Enrollment limited to textile science students in non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. 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 mechanical properties of fibers and orientation in web structure. Effect of processing conditions on bonded structures. Prereq: Organic chemistry or consent of instructor.

526 Nonwovens Science and Technology II (3) Interrelations between mechanics of production and mechanical properties of nonwoven fabrics; characterization of fiber morphology and web structure; chemistry of nonwovens binders and finishes; and engineering of specific fabric properties. Prereq: 521 or equivalent.

528 Laboratory Methods in Nonwovens Processing and Characterization (3) Laboratory experience in nonwovens fabrication processes and characterization techniques. Effect of processing conditions on structure development and properties of different types of webs. Prereq: 510 and 521.

552 Economics of Textile Complex (3) Economics consideration of U.S. textile complex. Quantitative approaches to industry structure, production market, distribution and institutions within both global and domestic settings. Current and future international issues and implications. Prereq: Calculus III or equivalent; micro economics. F.A


590 Research Seminar (1) Research topics in textile science. May be repeated. S/NC only. F.Sp.

593 Directed Study (1-3) Individual problems in textile science. Prereq: 9 hrs textiles graduate coursework. May be repeated. Maximum 9 hrs.

595 Advanced Topics in Textile Science (1-3) Lecture, group discussion, individual research on advanced topics and research areas of current significance to textile and consumer sciences. Prereq: 9 graduate hours in consumer sciences. May be repeated. Maximum 9 hrs.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
504 Special Topics (1-3) Instructor-initiated course offered at convenience of academic unit on topics of current interest. May be repeated. Maximum 15 hrs. S/NC or letter grade. E
518 Educational Specialist Research and Thesis (3) May be repeated. P/NP only. E
520 Statistics and Research Design: Conceptual (3) Consumer-oriented, conceptual treatment of statistics, research design, and quantitative basis of testing. E
525 Formal Measurement in Education and Counseling (3) Principles of test construction and item analysis. Survey of standardized tests of intelligence, achievement, aptitude, vocational interest, attitudes and personality. Prereq: 520 or equivalent. F, Su
535 Ethical, Legal, and Professional Issues in Counseling (3) Professional practice issues in school and community counseling and related fields: education, research, standards of practice, credentialing, and policy. Prereq: Admission to counseling program or consent of instructor. Su, A
550 Introduction to Pupil Personnel Programs (3) History, philosophy, professional standards, counselor role in relation to school staff and mental health professionals, and ethics of profession. F
551 Theory and Practice of Counseling (3) Philosophical bases of helping relationships; development of counselor and client self-awareness; counseling theory/techniques. F, Su
552 Career Development: Vocational Theory, Research and Practice (3) Relationship of vocational theory, career development research and societal factors to life career roles. F
553 Career and Educational Information Systems and Resources (3) Use of print and non-print materials; computer-based systems, for career and educational planning. Prereq: 552 or consent of instructor and Internet access account. Sp
554 Group Dynamics and Methods (3) Theory and types of groups, descriptions of group practices, methods of facilitative skills, supervision of leadership skills. E
555 Practicum in Counseling (3) Supervised practice and application of counseling skills with individual clients. Prereq: Admission to program, 431, 525, 551 and consent of instructor. May be repeated. Maximum 9 hrs. E
556 Orientation to Mental Health Counseling (3) Mental health counseling as profession: professional organizations, work settings, code of ethics, certification requirements, and role identity. F, Sp
558 Internship in School Counseling (1-6) Supervised postpracticum employment at academic unit approved site. Prereq: 550 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E
559 Internship in Community Agency Counseling (1-6) Supervised postpracticum employment at academic unit approved site. Prereq: 550 and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E
561 Development and Operation of School Counseling Programs (3) Management of comprehensive school counseling programs to include needs assessment, program goals, resource identification, evaluation, and use of computer-based program management software. Prereq: 550. Sp, Su
565 Facilitation of Technical Task Groups (3) Technical and social aspects of group dynamics in context of technical task groups. Application of counseling techniques to facilitation of workplace teams. Prereq: 551, 554, or consent of instructor. E
566 Approaches to Family Intervention and Counseling (3) (Same as Child and Family Studies 566.)
570 Cross-Cultural Counseling: Theory and Research (3) Theory and research on issues and problems in counseling of clients from different cultural backgrounds in U.S. and abroad. Sp
571 Individual Cognitive Assessment in Counseling (3) Basic concepts and applications in individual assessment of intelligence; proficiency in administrative scoring, interpretation for Wechsler, adults and children. Stanford-Binet. Prereq: 525 and 520 and admission to counseling program or consent of instructor. S/NC only. Sp, A
585 Seminar in Gerontology (1) (Same as Human Ecology 585, Educational Psychology 585, Exercise Science 585, Nursing 585, Public Health 585, Social Work 585, and Sociology 585.)
593 Independent Study (1-3) May be repeated. S/NC or letter grade. E
600 Doctoral Research and Dissertation (3-15) P/NP only. E
602 Directed Research (1-3) Instructor- or student-initiated group investigation of empirical and theoretical areas in educational and counseling psychology. May be repeated. Maximum 12 hrs. S/NC only. E
604 Special Topics (1-3) Instructor-initiated course offered at convenience of academic unit on topics of interest. May be repeated. Maximum 15 hrs. S/NC or letter grade. E
625 Advanced Study in Personality (3) Theory, research and conceptual analysis of studies with application to education and counseling. Prereq: 431 or equivalent.
635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Psychology 635 and Educational Psychology 635.) Sp
650 Seminar in Counseling Education (1) Professional issues related to role and function of counselor educator. Prereq: Admission to doctoral program in counselor education. May be repeated. Maximum 2hrs. S/NC only. F
655 Practicum in Counselor Education (3) Supervised practice and application of counseling skills with clients. Prereq: Admission to counselor education program and consent of instructor. May be repeated. Maximum 6 hrs. Sp
659 Internship in Counseling Education (1-6) Supervised employment in academic unit approved internsh ip site. Prerequisite for candidacy. May be repeated. Maximum 12 hrs. S/NC only. E
661 Education Implications of Neuropsychology (3) Theory and assessment. Common syndromes and their behavioral and cognitive manifestations. Prereq: 516, and 541 or equivalent individual assessment course; or consent of instructor. Sp, A
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 135 clock hrs required each semester. Prereq: Admission to counseling psychology doctoral program, 555, and...

529 Teaching Reading to Deaf/Hard of Hearing (3) Specific methods necessary to teach clients; assessing 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. Qualifications of service providers, Assessment, plan development, and provision of services to people who have disabilities and vocational handicaps. Identification, mobilization, and utilization of rehabilita- tion resources.

532 Caseload Management in Rehabilitation (3) Techniques and procedures involved in management of caseloads in Federal-State vocational rehabilitation agencies, private rehabilitation agencies, 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 clients in seeking, obtaining, and retaining employment. Job analysis, job modification, and re-engineering, marketing, and employer-servicing techniques; legislation impacting job placement; supported work; and use of occupational information.

535 Vocational Evaluation: Statistical Methods (3) Procedures and principles used to determine vocational assets and liabilities of people with disabilities. Functional analysis of biographical and inter- view data; selection 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.

538 Disability Management (3) Return-to-work issues in disability management programs: early intervention, quality services, and cost containment; standards and procedures for rehabilitation counselors/case manage- ers.

541 Psychosocial Aspects of Disability (3) Psycho-social impact of disability 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. Restricive 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 hrs required).

579 Special Topics (1-3) Prereq: Admission to graduate program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

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/clients. Delivery of assistive technology software programs and assistive devices, delivery systems, interdisciplinary evaluation/plan- ning, and funding issues.

602 Seminar in Social Processes 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.

603 Seminar in Research in Special Education and Rehabilitation (3) Development and implementation of research, Independent research studies. Research proposals. Prereq: 9 hrs of research core and consent of instructor.

610 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prereq: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

620 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in theoretically-based research; public school, institutional, agencies or university settings. Prereq: 9 hrs in statistical and research methods. May be repeated. Maximum 9 hrs. S/NC only.

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under supervision of practitio- ner. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

679 Special Topics (1-3) Prereq: Admission to doctoral program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

693 Independent Study (1-3) May be repeated. S/NC or letter grade.
Graduate Admissions: Former college transcripts, test scores, letters of recommendation, and a statement of professional goals and reasons for applying to the program are required. Applicants for the doctoral degree are expected to have made substantial contact with potential research advisors in the department's graduate programs.

THE MASTER'S PROGRAMS

In addition to general requirements of the Graduate Council, aspirants for the Master of Science degree are expected to: (1) during the first year in residence, take a prescriptive diagnostic examination covering major concepts in ecology and evolutionary biology. The examination may be taken twice and must be passed before the student is admitted to candidacy; (2) complete course requirements as determined by the department's faculty dissertation research committee; (3) satisfactorily complete and defend a research thesis.

THE DOCTORAL PROGRAMS

In addition to general requirements of the Graduate Council, aspirants for the Doctor of Philosophy degree are expected to: (1) during the first year in residence, take a prescriptive diagnostic examination covering major concepts in ecology and evolutionary biology. The examination may be taken twice and must be passed before the student is admitted to candidacy; (2) complete course requirements as determined by the department's faculty dissertation research committee; (3) satisfactorily complete and defend a dissertation. The department does not require a reading knowledge of a foreign language, but this may be imposed by the student's faculty dissertation research committee. If so, the student has the option of demonstrating reading knowledge of the prescribed language, or by taking a traditional exam.

MINOR IN ENVIRONMENTAL POLICY

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

GRADUATE COURSES

411-12 Minicourse in Ecology and Evolutionary Biology (2) Selected advanced topics in ecology, behavior, and evolutionary biology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: Admission to program in Ecology and Evolutionary Biology. Re-quired of all first-year students. S/C only.

419 Science as Method (3) Dynamic process of scientific discovery. Comparisons of science, non-science, pseudoscience, successful and unsuccessful science. Ethics of scientific research, philosophical aspects of scientific enterprise, and implications for teaching and writing about science. Prereq: Literature science or philosophy course, or consent of instructor. (Same as Botany 419 and Philosophy 419.)

431 Plant Ecology (4) (Same as Botany 431.)

446 Introduction to Oceanography (4) Basic oceanography: physical, chemical, geological and biological processes and patterns. Oceanic subsystems: upwellings, polar oceans, hydrothermal vents, gyres, coral reefs, estuaries, and coastal regions. Field trip to coast required. Prereq: General Biology and General Chemistry; General Ecology recommended.

450 Comparative Animal Behavior (3) Principles and methods of ethology: ecological, developmental, physiological and evolutionary aspects. (Same as Psychology 450.)

459 Comparative Animal Behavior Laboratory (3) Introduction to observational and experimental research in ethology. Coreq. 450. (Same as Psychology 459.)


461 Special Topics in Organismic Biology (3) Evolution, ecology, biogeography, classification, and anatomy of selected animal and plant taxa. Prereq: General Ecology or consent of instructor.

470 Aquatic Ecology (3) Introduction to the physiochemical nature of inland waters with description of biotic communities and their interrelationships. Prereq: Chemistry 120-130 General Chemistry, Biology 250 General Ecology. 2 hrs and 1 lab.


484 Conservation Biology (3) Application of principles and techniques of ecological research to conservation of biological diversity at genetic, population, community, and ecosystem levels. Prereq: Biology 240 General Genetics, 250 General Ecology.

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

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

503 Ecology and Evolutionary Biology Seminar (1) Advanced topics in ecology, behavior, and evolutionary biology. Senior departmental majors encouraged. Required of all first- and second-year graduate students. May be repeated. Maximum 4 hrs. S/C only.

504 Special Topics (1-3) Selected directed readings or special course in topics of current interest. Consult departmental listing for offerings. May be repeated with the consent of instructor. Maximum 9 hrs. S/C only.

508 Introduction to Faculty Research (1) Orientation of new graduate students to current research of departmental graduate faculty. Prereq: Admission to program in Ecology and Evolutionary Biology. Required of all first-year students. S/C only.

509 Foundations: Readings in Ecology (1-2) Readings and discussion of classic papers in field.

511 Foundations: Readings in Evolution (1-2) Readings and discussion of classic papers in field.
512 Foundations: Readings in Conservation Biology (2) Readings and discussion of classic papers in field.

514 Foundations: Readings in Mathematical and Computational Ecology (2) Readings and discussion of classic papers in field.

515 Foundations: Readings in Environmental Toxicology (1-2) Readings and discussion of classic papers in field.

516 Colloquium in Ethology (1) (Same as Psychology 516.)

520 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. Appropriate for students in Planning and Environmental Engineering. Not intended for graduate students in Ecology and Evolutionary Biology. 

524 Physiological Ecology of Animals (3) Adaptive physiological response of animals to natural changes in or extremes of physical and biotic environment. Terrestrial vertebrates. Prerequisite: Undergraduate courses in animal physiology and ecology. Biochemistry and Cellular and Molecular Biology 440 and General Ecology or equivalent.

535 Ecology and Development in the Amazon (3) Natural history, ecosystem diversity and function, and appraising the sustainable development of Amazon Basin. Field trip of 7-10 days to Manaus, Brazil.

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. Prerequisite: 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. Prerequisite: 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 levels of insects. Prerequisite: Consent of instructor.

543 Aquatic Insects (3) Taxonomy and biology of aquatic insects; immature forms. Prerequisite: Consent of instructor. 2 hrs and 1 lab.

544 Fresh Water Invertebrate Zoology (3) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Prerequisite: Comparative Invertebrate Biology or equivalent and consent of instructor. 3 hrs lab and field study.

545 Advanced Animal Behavior (3) Second-level course in ethology, stressing evolution, genetics, physiology, and human behavior. Prerequisite: 450 or equivalent. (Same as Psychology 545.)

546 Ethological Psychology (3) (Same as Psychology 546.)

547 Conceptual Foundations of Evolution and Behavior (3) (Same as Psychology 547.)

552 Development Planning in the Third World (3) (Same as Planning 552.)

555 Environmental Planning (3) (Same as Planning 555.)

556 Ice-Age Environments and Global Climate Change (3) Glacial-interglacial climatic cycles and dynamic responses of landscapes within glacial, periglacial, and non-glacial environments across North America over past 2.5 million years. (Same as Geology 556.)

557 Quaternary Ecology (3) Perturbation, process, and pattern within Quaternary ecosystems; climatic change and vegetational response during last 2.5 million years. Prerequisite: Consent of instructor. (Same as Geology 557.)

560 Biometry (3) Statistical applications in biological research. Prerequisite: Statistics course or consent of instructor.

561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; reproductive toxicology; mutagenesis, teratogenesis, carcinogenesis, pathologic changes and environmental impact. Prerequisite: Biochemistry and Cellular and Molecular Biology 410, Organic Chemistry or consent of instructor. (Same as Biochemistry and Cellular and Molecular Biology 561.) F

575 Ecological Genetics (3) Genetics of natural populations, using both single-locus and quantitative genetical approaches. Prerequisite: Statistics course.

577 Landscape Ecology (3) Ecological structure, function, and change through time of landscape mosaics: quantitative measures of landscape heterogeneity; responses of organisms to changes in landscape heterogeneity. Prerequisite: General Ecology or equivalent or consent of instructor.

581-582 Mathematical Ecology (3,3) (Same as Mathematics 581-582.)

583 Zoogeography (3) Processes determining geographic distributions and composition of animal communities. Prerequisite: Ecology course or consent of instructor.

585 Mathematical Evolutionary Theory (3) (Same as Mathematics 585.)

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

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

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

599 Advanced Evolutionary Ecology (3) (Same as Botany 599.)

600 Doctoral Research and Dissertation (3-15) A dissertation. Prerequisite: Consent of instructor. May be repeated with consent of department.

602 Advanced Topics in Ecological Process and Structure (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in ecological processes and structure. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs.

603 Advanced Topics in Evolutionary Biology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in evolutionary biology. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs.

608 Advanced Topics in Conservation Biology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in conservation biology. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs.

607 Seminar in Ecology and Evolutionary Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

609 Advanced Topics in Comparative Animal Behavior (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in animal behavior. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs.

610 Advanced Topics in Mathematical, Theoretical, and Computational Ecology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in mathematical, theoretical, and computational ecology. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs.

611 Advanced Topics in Organismal Biology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in organismal biology. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs.

612 Advanced Topics in Environmental Toxicology (1-3) Exposure and in-depth training in contemporary topics and approaches important to advanced research in environmental toxicology. Consent departmental listing for offerings. May be repeated with consent of department. Minimum 9 hrs. (Same as Biochemistry and Cellular and Molecular Biology 612.)

635 Environmental Assessment and Sustainable Development in Third World Countries (3) Concepts and methods of environmental impact assess-

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**Economics**

(Majors of Business Administration)

**DEGREES**

Economics ........................................ M.A., Ph.D.

Matthew N. Murray, Head

Professors:

Bohm, Robert A., Ph.D., (Emeritus) ......... Washington (St. Louis)
Bowby, Roger L. (Emeritus), Ph.D., ....... Texas
Carroll, Sidney L. (Emeritus), Ph.D., ....... Harvard
Chang, Hui S., Ph.D., ......................... Vanderbilt
Clark, Don P., Ph.D. ......................... Michigan State
Cole, William E. (Emeritus), Ph.D. ........... Texas
Davidson, Paul (Emeritus), Ph.D. .......... Pennsylvania
Fox, William F., Ph.D. ...................... Ohio State
Hertzog, Henry W., Ph.D. ................. Maryland
Jensen, Hans E. (Emeritus), Ph.D. ....... Texas
Lee, Feng-Yao (Emeritus), Ph.D. .......... Michigan State
Moore, John R. (Distinguished Prof.) (Emeritus), Ph.D. ......... Cornell
Murray, M. N., Ph.D. ....................... Syracuse
Neale, Walter C. (Emeritus), Ph.D. ......... London
Russell, Milton (Emeritus), Ph.D. .......... Oklahoma
Spiva, George A. (Emeritus), Ph.D. ...... Texas

Associate Professor:

Gauger, Jean A., Ph.D. ..................... Iowa State

Assistant Professors:

Barkoulas, John, Ph.D. ............... Boston College
Bruce, Donald, Ph.D. ..................... Syracuse
Fallaschetti, Dino, Ph.D. .......... Washington (St. Louis)
Mohnis, Mohammed, Ph.D. ............. York
Munkin, Murat, Ph.D. .................... Indiana
Santore, Rudy (Liaison), Ph.D. .......... Ohio State
Stewart, Steven W., Ph.D. ............. New Mexico

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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.

**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 graduate grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester's coursework established by the degree program for full-time students and the next two semester's coursework as...
established by the degree program for part-time students.

**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 30 hours of coursework at the 400 level or above. Of these, at least 24 hours (at least 18 hours of which are in economics) must be at the 500 level or above. Of the minimum of 18 hours in economics at the 500 level or above, 12 hours must consist of 511, 512, and 513, 514, and the remaining 6 hours must be in one field of economics. Of the 30 hours, a maximum of 9 hours in courses approved by the department may be taken in fields other than economics. Students electing the non-thesis option are required to pass a final comprehensive examination. The thesis option requires 30 hours of coursework at the 400 level or above, including at least 24 hours at the 500 level or above, 6 hours of which may be thesis hours. Of the remaining 18 hours at the 500 level or above, at least 15 hours must be in economics and must include 511, 512, 513, and 514. A maximum of 6 hours may be in an area other than economics.

**THE DOCTORAL PROGRAM**

Admission to the Ph.D. program is based on promise of outstanding scholarship as demonstrated by previous academic performance, by scores achieved on the GRE, and by recommendations. The program requires a minimum of 48 hours of coursework beyond the bachelor’s degree or 24 hours 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 taken not later than the beginning of the fourth semester of study.
   b. History of Economics: Completion of 515 or 615 with a grade of B or better, or by qualifying examination.
   c. Quantitative Methods: Completion of 581, 582 and 583 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 for a third time will result in 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 a comprehensive examination must retake the examination the next time offered. A comprehensive examination in a specific field may be taken a third time only with approval of the department.

   - 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 core subject areas and outside the fields of specialization.
   - 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 and doctoral level graduate 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 the following participating departments and programs: Agricultural Economics and Rural Sociology; Botany; Civil and Environmental Engineering; Ecology and Evolutionary Biology; Economics; Forestry, Wildlife and Fisheries; Geography; Management; Planning; Political Science; and Sociology.

Students may request admission to the minor following graduation to a graduate 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 major discipline and one course in quantitative methods are required. These requirements may be fulfilled before or after admission to the minor. All 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 and Evolutionary Biology 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 major discipline approved by the coordinating committee.

   - Doctoral students seeking a minor in environmental policy must also complete, in addition to above, a policy-relevant dissertation approved by the coordinating committee.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The Ph.D. program in Economics is available to residents of the state of Kentucky. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

**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.


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.

471 Public Finance: Optimal Government Functions and Expenditure Analysis (3) Problems of collective consumption, external effects, public investment, social decision making. Major writing requirement. Prereq: 201.

472 Public Finance: Taxation and Intergovernmental Relations (3) Analysis of individual taxes and of tax systems, non-tax 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 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 (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

511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of revealed preference, attributes of goods and implicit prices, market demand, labor supply, individual behavior under uncertainty, theory of firm, theory of production and cost, market structures, derived demand and factor pricing, introduction to welfare economics, market failure and theory of 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 functions 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.

537 Managing in a Regulated Economy (3) Economic effects of antitrust and public utility, international and environmental regulation on business. Development of decision-making skills in area of government-business relations.

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.


Econometric Techniques (3) Multivariate time series, panel data and limited dependent variable analysis applied to economic problems. Prereq: 582.

Labor History and Legislation (3) Consent of instructor.

Enterprise economy. Problems of monopoly and nonrenewable resources. Exploration of issues related to market failure and differences between renewable and nonrenewable resources.

Consent of instructor.

Industrial Organization and Public Policy (3) Advanced topics in economics. May be repeated. Maximum 9 hrs.


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.

Economic Development: Western Impact on Asia and Africa (3) Studies of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: 21 hrs of upper division undergraduate social science or consent of instructor.


Labor History and Legislation (3) Development of organized labor as important economic and political force in U.S., from Colonial times to present. Evolution of legal status of labor unions and of individual workers vis-a-vis their employers.

Monetary Theory (3) Study of money, credit, and liquidity as related to real output determination, interest rates, employment, and prices. Prereq: 513.

Topics in Monetary Theory (3) Advanced monetary models, issues in monetary policy, open economy monetary theory and policy. Student participation. Prereq: 651.

Regional and Urban Location and Development Theory (3) Theory of industrial and agricultural location and human migration. Economic basis for land-use patterns, center places, and urban form. Spatial inequalities and urban problems. National policies for regional and urban assistance.

Methods of Regional and Urban Analysis (3) Theory of regional/urban economic structure and growth. Regional income and product accounts, shift and share analysis, economic base studies, and regional/urban input-output models. Theory and problem solution.

Public Finance: Optimal Government Size and Expenditure Analysis (3) Theory of public goods and externalsities; public choice. Expenditure incidence and determinants; benefit cost analysis.

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.

Environmental and Natural Resource Economics (3) Alternative paradigms for allocating and valuing environmental resources. Exploration of issues related to market failure and differences between renewable and nonrenewable resources.

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.

Econometric Methods (3) Advanced topics in econometrics. Prereq: 582 or equivalent.

Workshop (3) Advanced topics in economics. Student participation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


The concentration in rehabilitation counseling is fully accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP) and requires completion of 60 hours of coursework including supervised practicum and internship experiences working with clients. The concentration in school counseling is fully accredited by the Council for Accreditation of Counseling and Related Educational Programs and requires 48 hours of coursework, including supervised practicum and internship experiences working with clients. A final examination is required of all students.

The master’s degree with a major in Education has two tracks. Track 1 is intended for students who are licensed to teach English, elementary education, foreign language, mathematics, natural science, social science, early childhood special education, or education of the deaf and hard of hearing. (Non-licensed applicants to Track 1 will be reviewed on a case-by-case basis and must have a strong disciplinary background and professional goals which can be fostered through participation in this non-licensure program.) Track 2 is designed for students seeking initial teacher licensure in one of the above fields. Thesis and non-thesis options are available for both tracks.

Track 1 - Concentrations are available in:
- Art education
- Curriculum and Instruction
- Education of the deaf and hard of hearing
- Elementary education
- English education
- Foreign language/ESL education
- Instructional technology
- Mathematics education
- Modified and comprehensive special education
- Reading education
- Science education
- Social foundations
- Social science education
- Special education: early childhood

The thesis option requires the completion of 30 hours, including 6 hours of Thesis 500 (36 hours for instructional technology concentration). The non-thesis option requires the completion of 33 hours of coursework (36 hours for special education and instructional technology concentrations). Both options require a minimum of 12 hours in the major discipline (18 hours for special education concentration).

Track 2 - Concentrations are available in:
- Art education
- Education of the deaf and hard of hearing
- Elementary teaching
- Modified and comprehensive special education
- Secondary teaching
- Special education: early childhood
The thesis option requires completion of 36 hours, plus 6 hours of Thesis 500 for a total of 42 hours. The non-thesis option requires 36 hours, including 24 hours of prescribed licensure coursework and 12 hours in the academic discipline as approved by the student’s committee.

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

Educational Administration and Policy Studies
The master’s degree program with a major in Educational Administration and Policy Studies offers a concentration in educational administration and supervision, requiring a minimum of 36 hours, including 6 hours of Thesis 500 for the thesis option, or 36 hours for the non-thesis option.

The concentration in educational administration and supervision consists of a minimum of 18 hours of coursework in Educational Administration and Supervision. A final oral examination is required for the thesis option, with a written exam at the option of the committee. A final written comprehensive examination is required for the non-thesis option, with an oral exam at the option of the committee. Students entering either of these options must complete the introductory core consisting of Educational Administration and Supervision 513, 515, 516, and 535 or a demonstrated computer proficiency. These courses are prerequisites to other courses in the unit.

Educational Psychology
The master’s degree with a major in Educational Psychology is offered with concentrations in:
- Adult education
- Individual & collaborative learning

Both programs include thesis and non-thesis options. The major in Educational Psychology requires 36 hours. The concentration in adult education requires a minimum of 12 hours in adult education courses. A final examination is required of all master’s degree students.

Human Performance and Sport Studies
The master’s degree with a major in Human Performance and Sport Studies offers concentrations in:
- Exercise science
- Sport management
- Sport studies

Applicants must submit an admission application and 3 letters of recommendation. Both thesis and non-thesis options are available. The non-thesis option requires 32 hours (sport management concentration requires 33 hours), including a project, and a course in research design or an approved specialized research class. The thesis option requires the completion of 30 hours, including 6 hours of Thesis 500. Both options require a minimum of 12 hours of sport studies, exercise science, or sport management courses.

THE SPECIALIST IN EDUCATION PROGRAM
The Educational Specialist degree program with a major in Education encompasses concentrations in:
- Curriculum
- Educational administration & supervision
- Elementary education
- English education
- Foreign language/ESL education
- Instructional technology
- Mathematics education
- Reading education
- School counseling
- School psychology
- Science education
- Social science education
- Special education

The instructional and curricular concentrations require completion of a minimum of 30 hours of coursework beyond the master’s degree, including 6 hours in core courses, 18 hours in specialized courses, and 6 hours to be determined by the student’s committee.

Educational administration and supervision concentration requires the completion of a minimum of 30 hours beyond the master’s degree. Both thesis and non-thesis options are available. The school counseling concentration requires a minimum of 22 hours beyond the master’s degree but not fewer than 60 hours beyond the baccalaureate, including practicum and internship experiences. The school psychology concentration requires the completion of a minimum of 66 semester hours beyond the baccalaureate. Refer to Degree Requirements under Graduate Studies for complete program requirements.

THE DOCTOR OF EDUCATION PROGRAM
The Ed.D. program with a major in Education is available in the following concentrations and specializations:
- Curriculum, educational research, and evaluation (curriculum, educational research, evaluation)
- Educational administration and policy studies (educational administration and supervision, higher education)
- Educational psychology (collaborative learning)
- Instructional technology (educational applications of technology)

The program requirements are:
- Curriculum, educational research, and evaluation (curriculum, educational research, evaluation)
- Educational administration and policy studies (educational administration and supervision, higher education)
- Educational psychology (collaborative learning)
- Instructional technology (educational applications of technology)
- Literacy, language education, and ESL education (literacy, ESL education)
- Teacher education (elementary education, social science education, mathematics education, science education)
- In addition to the requirements of the Graduate Council, the hour requirements in the curricular and instructional concentration areas are determined by the student's doctoral committee. A comprehensive examination and an oral examination on the dissertation are required.

The concentration in educational psychology with a specialization in collaborative learning requires the completion of a minimum of 90 hours beyond the baccalaureate degree and incorporates a cohort model through which students participate in core courses as a group. This program offers an alternative residency which includes a two-year, on-campus, continuous enrollment in six to nine hours per semester including summers. During this time period, students are enrolled in a doctoral seminar (EP630) for four of the six semesters and participate with faculty on research teams for 12 of the required hours. Contact the program coordinator for additional information and program requirements.

The requirements for the concentration in educational administration and policy studies are determined on an individual basis by each student’s doctoral committee. Course requirements include a 6-9 hour cognate within the college and a 6-9 hour minimum external to the college. Additional course requirements include completion of two consecutive semesters of Educational Administration and Policy Studies 604 during residence. Though an internship is highly recommended, it is not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination, as well as an oral examination on the dissertation, is required. An alternative residency, which includes a two-year, on-campus, continuous enrollment in Educational Administration and Policy Studies 606, Leadership Forum, is available for qualified students.

THE DOCTOR OF PHILOSOPHY PROGRAM
Faculty from all six departments participate in the delivery of the Ph.D. degree program with a major in Education. Concentrations and specializations are available in the following areas:
- Counseling psychology (gender and cultural issues in counseling, career development, group process, counseling service, assessment)
- Counselor education (school counseling, counseling service) (Not currently accepting new students)
- Cultural studies in education (social and cultural theory)
- Curriculum, educational research, and evaluation (curriculum, educational research, evaluation, educational applications of technology)
- Early childhood education (early childhood special education)
- Educational administration and policy studies (educational administration and supervision, higher education)
- Educational psychology (adult education, applied educational psychology)
- Exercise science (biomechanics/sports medicine, exercise physiology, physical activity and population health)
- Instructional technology (educational applications of technology)
- Literacy, language education, and ESL education (literacy, ESL education)
- Teacher education (elementary education, gifted and talented education, mathematics education, science education, social science education)

The program requirements are:
degree program are available through the College of Education Student Services Center, Claxton Complex A332, (865) 974-8194, or ldmorgan@utk.edu.

CERTIFICATE IN URBAN EDUCATION

The Department of Theory and Practice in Teacher Education offers a certificate program in urban education for experienced urban teachers. A cohort group is competitively selected each year.

Participants complete a 12-credit, four-course program of study over a two-year period. First-year courses are Theory and Practice in Teacher Education 595 Special Topics (Trends and Issues in Urban Education) and Education 540 Topics in Improvement of Instruction (Improving Teaching and Learning in Urban Schools). Second-year courses are Theory and Practice in Teacher Education 595 Special Topics (Accommodating Diverse Student Needs in Urban Classrooms) and 550 Action Research and Practical Inquiry in Education.

MINOR IN GERONTOLOGY

Graduate students with majors/concentrations in counseling, exercise science, or educational 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 on an in-state tuition basis. The M.S. Counseling is available to residents of the state of Florida (concentration in rehabilitation counseling) or Kentucky (concentration in mental health counseling). The M.S. program in Education (concentration in education of the deaf and hard of hearing) is available to residents of the states of Alabama, Maryland, South Carolina, Virginia, or West Virginia. The M.S. program in Human Performance and Sport Studies is available to residents of Alabama, Arkansas, Maryland, South Carolina, Virginia, or Virginia. The Ed.D. program in Education (concentration in educational psychology) is available to residents of Kentucky. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

510 Advanced Educational and Clinical Procedures (3-6)
Integration of advanced educational and clinical procedures; skills and knowledge for implementing instruction and for consulting with other persons in treatment of exceptional individuals. May be repeated. Maximum 6 hrs.

540 Topics in Improvement of Instruction (1-3)
Special conferences, workshops, and inservice programs. May be repeated. Maximum 6 hrs. S/NC only.

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

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

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

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

576 Practicum in Classroom Teaching (1-8) Teaching and teaching-related experiences in elementary and secondary school settings. Specific hours and school level assignment determined by licensure or certification requirements. May not be used for probationary licensure year. May not be used toward degree requirements. May be repeated. Maximum 12 hrs. S/NC only.

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

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.

601 Trans-College Seminar (1) Introduction to Ph.D. program in Education: research requirements, meaning of scholarship in academic and issues/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. Maximum 3 hrs. May not be used to meet 600 hour requirement. S/NC only.

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

Educational Administration and Cultural Studies

(Majors of College)

MAJORS

DEGREES

College Student Personnel ........................ M.S. Education ................................. M.S., Ed.S., Ed.D., Ph.D.

Educational Administration and Policy Studies .............................................. M.S. Human Performance and Sport Studies .. M.S.

Joy T. DeSensi, Head

Professors:

Cultural Studies in Education

GRADUATE COURSES

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

501 Special Project (3) Cumulating experience for non-thesis major. Research study suitable for publication, or practicum requiring special written work. Prereq: 552. 

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

503 Problems in Lieu of Thesis (2-3) May be repeated. Maximum 9 hrs. S/N/C only, E

505 History of Olympics: Ancient and Modern (3) Examination of various aspects of ancient and modern Games. Ancient Olympics 776 BC to 393 AD; Panhellenic Games; Modern Olympics, 1896 to date; political, social, class, gender, and economic issues that influence Games. 


514 Advanced Philosophy of Sport (3) Major philosophical theories of sport. Various conceptual, moral, aesthetic, and social-political issues. F

515 Social Theories of Sport (3) Liberal, democratic and Marxist social theories of sport. Sp

526 Philosophy of Education (3) Description, interpretation, and critique of philosophical/theoretical arguments: truths, knowledge and values in relation to education.

532 Professional Practice Issues in Sport Psychology (3) Study and critique of various aspects of professional practice in sport psychology.

533 Psychology of Sport (3) Social psychological factors influencing human behavior in sport context; discussion of contemporary theory, research, and methodology. Prereq: General psychology course or consent of instructor.

534 Motor Behavior and Skill Acquisition (3) Topical explanations and applications of principles of human movement behavior to acquisition and performance of skills; discussion of current research and methodology.

535 Health and Exercise Psychology (3) Study and cultural critique of various aspects of exercise psychology.

537 Sport Psychology Seminar (1) Issues and problems in applied sport psychology. Analysis and synthesis of research literatures and discussion of sport psychology consultation practices and other topics. May be repeated. Maximum 3 hrs. S/N/C only.

539 Development of Education Thought (3) Historic and philosophic approach to lives and writings of influential educators: Plato, Aristotle, Kant, Comenius, Rousseau, Pestalozzi, Froebel, Dewey. Prereq: Graduatc status and consent of instructor. Sp,Su

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

541 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. May be repeated.

542 Sociological Aspects of Sport (3) Social and cultural factors influencing sport and physical education. Pertinent issues and research applications. Prereq: Consent of instructor. F

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

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

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

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

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

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

560 Introduction to Qualitative Research in Education (3) Fundamentals of qualitative research methods leading to 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,Su

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

590 Cultural Studies Seminar (1) Two semester sequence (Fall and Spring); ongoing discussion about cultural studies; popular cultural, interdisciplinary work, social justice issues, Presentations, videos and readings. May be repeated. Maximum 4 hrs. S/N/C only, F,Sp

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

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

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

594 Supervised Readings (1-3) May be repeated. S/N or letter grade, E
595 Special Topics (1-3) Advanced study in selected aspects of cultural studies. May be repeated. Maximum 9 hrs. S/NC or letter grade.

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

607 Advanced Seminar in the Social Foundations of Education (3) Interdisciplinary team-taught seminar. Readings selected by faculty and participants from classic studies and current periodical literature in anthropology, sociology, history, and philosophy of education. Part of general core for Ph.D. program. Prereq: Doctoral student in Education. F

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. Sp

609 Feminist Epistemologies and Education (3) Theoretical research currently presented by feminist philosophers questioning traditional (male) epistemologies; application of these feminist epistemological theories to current feminist work in education.

625 Seminar in History of Education (3) Selected historical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. Sp

633 Advanced Sport Psychology (3) Analysis, synthesis, and discussion of contemporary theory and topics; research development and production in sport psychology. May be repeated. Maximum 9 hrs.

648 Topics in Sociology of Education (3) May be repeated.

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.


681 Practicum (1-3) Intern experience in areas of major interest. May be repeated.

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

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

695 Special Topics (1-3) Study for doctoral students in selected aspects of cultural studies. May be repeated. Maximum 9 hrs. S/NC or letter grade.

Educational Administration and Supervision

Graduate Courses

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

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

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


514 Leadership Themes in Literature (3) Review and analysis of selected literature works—novels, biographies, poetry, plays, essays, personal letters and speeches, history—for lessons that enhance understanding of leadership. May be repeated. S/NC only. E

515 Human Relations and Communication in Administration (3) Development of interpersonal communication skills and channels, intergroup relations, supportive work climates, personnel motivation, conflict, communication skills, motivation, values, attitudes, and expectations in administration. F,Su

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

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

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

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

521 Research Methods in Educational Administration (1-3) Directed readings of current educational research. Prereq: M.S. introductory core or consent of instructor. F,Su

522 Administration of Special Services (3) Legal, programmatic, and ethical responsibilities of educational administrators in design and implementation of special service programs within school settings. Special emphasis on programmatic and interorganizational issues. Prereq: M.S. introductory core or consent of instructor. F,Su

523 Administration of Special Services (3) Legal, programmatic, and ethical responsibilities of educational administrators in design and implementation of special service programs within school settings. Special emphasis on programmatic and interorganizational issues. Prereq: M.S. introductory core or consent of instructor. F,Su

524 School Finance and Business Management (3) For prospective building level administrators. Financial and logical management tasks and procedures in individual school setting. Prereq: M.S. introductory core or consent of instructor. F,Su

526 Supervision and Personnel Administration (3) Basic supervisory and personnel concepts and related competencies; building (or micro-organizational) level; individual and group counseling; selection, training, and maintaining employee information, supervision of instructional and non-instructional personnel, clinical supervision, staff evaluation, and staff development. Prereq: M.S. introductory core or consent of instructor. Sp,Su

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


545 Policy Issues in Educational Law, K-12 (3) Legal arrangement of case and statutory materials for public school administrators and teachers; problems concerning law and public education. Prereq: M.S. introductory core or consent of instructor. F,Su

580 Internship in Educational Administration (3) Field experience in appropriate educational setting working with an administrator. Placement of student at end of planned year, placement by department assignment. Prereq: M.S. introductory core or consent of instructor. Sp,Su

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

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

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

595 Seminar in School Leadership, K-12 (3) On-site study of quality school processes throughout region. Processes that make organizations “benchmarks of quality.” Prereq: Consent of instructor. May be repeated. S/NC or letter grade. F,Su

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

605 Advanced Seminar in Administrative Theory (3) Interdisciplinary seminar. Readings selected by faculty for research and scholarly value from early to current classic theoretical studies and current periodical literature in administrative theory. Prereq: 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/NC only. E

614 Statistics for Educational Administrators (3) Descriptive and experimental research methods, parametric and non-parametric statistical techniques used in research. Sp,Su

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

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

629 Seminar in Policy Issues in Education (3) Local, state, and federal education policy: theory analysis, development and implementation. Why education policy is changing rapidly, ways to follow and influence education research, and national frameworks to use for future understanding. Prereq: 529, 616 or equivalent or consent of instructor. F
646 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

565 Legal Issues in Education (3) School law; constitutional foundations as they relate to public education at state and local levels. F, Su

655 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 knowledgeable, 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, Su

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

### Higher Education

#### GRADUATE COURSES

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

534 Program Evaluation in Education (3) (Same as Instructional Technology, Curriculum and Evaluation 535).

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

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

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

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

570 Student Affairs Administration in Higher Education: Theory & Practice (3) Historical, philosophical, and organizational perspective. Functional areas comprising field and major issues.

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

574 The College Student (3) Today's college student beginning with transition into college, through critical first year and beyond, culminating in senior year and another period of transition.

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

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

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

640 Policy Issues in College and University Law (3) Legal precedent affecting organizations, administration, and finance of higher education. Academic free-speech, faculty tenure, litigation, tort liability, administrative law, academic due process and affirmative action in employment. Sp

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

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

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

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

### Educational Psychology

#### (College of Education)

**MAJORS DEGREES**

Education ......................... Ed.S., Ed.D., Ph.D.
Educational Psychology ............... M.S.

R. S. McCallum, Head

Professors:
Bellon, Jerry J. (Emeritus), Ed.D., UC Berkeley
Brockett, Ralph G., Ph.D. .......... Syracuse
Dickinson, Donald J. (Emeritus), Ed.D. 边界 奥克拉荷马州
George, Thomas W., Ed.D. .......... Tennessee
Greenberg, Katherine H., Ph.D. ....... George Peabody
McCallum, R. S., Ph.D. .......... Georgia
Peters, John M., Ed.D. ............ NC State
Skinner, Christopher H., Ph.D. ...... Lehigh
Williams, R. L. (Liaison), Ph.D. .......... George Peabody

Associate Professors:
Bain, Sherry K., Ph.D. .... Southern Mississippi
Kindall, Luther M., Ed.D. .......... Tennessee
Ziegler, Mary F., Ed.D. .......... Columbia

The Department of Educational Psychology offers graduate programs leading to degrees, majors, and concentrations in:

**Master of Science**

**Educational Psychology**

**Adult education**

**Individual and collaborative learning**

**Educational Specialist**

**Education**

**School psychology**

**Doctor of Education**

**Education**

**Educational psychology**

**Doctor of Philosophy**

**Education**

**Educational psychology**

**School psychology**

See Education under Fields of Instruction for full description of all degree requirements. The department brings together four areas of graduate study related to teaching and learning across the lifespan. The department is committed to the creation and study of environments that enhance learning potential and promote lifelong learning for people of all ages, abilities, and backgrounds within our programs and the professional practices that we address. Assistantships and fellowships are available for qualified applicants.

For more detailed information about the department, see website at [http://web.utk.edu/~edpsych](http://web.utk.edu/~edpsych).

The adult education area is designed for individuals who seek to provide professional leadership in the education of adults. It offers two degree programs: Master of Science with a major in Educational Psychology, concentration in individual and collaborative learning, and Doctor of Philosophy with a major in Educational Psychology, specialization in educational psychology, specialization in adult education. For details, see website at [http://web.utk.edu/~adulted](http://web.utk.edu/~adulted).

The collaborative learning area is designed for professional practitioners who seek to increase their understanding of the collaborative learning process and its facilitation in their interaction with learners of any age in a variety of educational situations. It offers the Doctor of Education degree program with a major in Education, concentration in educational psychology, specialization in collaborative learning. For details, see website at [http://web.utk.edu/~collab](http://web.utk.edu/~collab).

The school psychology area offers advanced training in psychological, educational, and professional foundations leading to licensure as a school psychologist. It offers two degree programs: Educational Specialist with a major in Education, concentration in psychology, and Doctor of Philosophy with a major in Education, concentration in school psychology. The school psychology programs are accredited by the relevant bodies, including the National Association of School Psychologists (NASP), the American Psychological Association (APA), and the National Council for Accreditation of Teacher Education (NCATE). For details, see website at [http://web.utk.edu/~schpsy](http://web.utk.edu/~schpsy).

### Admission Requirements

Admission requirements include completion of all items in the department’s admissions packet and three letters of recommendation (i.e., rating forms). Up-to-date GRE scores are required for application to all degree programs except the master’s.
GRADUATE COURSES

432 The Disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding etiology, psychosocial behavior and appropriate interventions. F

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

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

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


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

505 Quasi-Experimental and Single-Subject Design Research (3) History, theory and research design techniques used to examine cause and effect relationships during applied psychoeducational research. Focus on controlling threats to internal validity through research design. Su

509 Internship in Adult Education (3) Practical field experiences in selected settings under supervision of practitioner and departmental representative. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

510 Psychological Theories of Human Development Applied to Education (3) Theory and research on emotions, social, and intellectual development over life span with applications to educational and therapeutic settings. F, Su

513 Reflective Practice in Education and Psychology (3) Concepts, theories and processes of reflective practice applied to educational settings. E

514 Individual Study in Adult Education (3) Prereq: Course with supervising instructor. Approval form must be completed in office of unit head. May be repeated. Maximum 6 hrs. E

515 Educational Applications of Behavioral Theories of Learning (3) Behavioral theories and research, conditioning, observational learning, and ethological learning as systems apply to student motivation, discipline and learning. Su

516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning, attribution and information processing as applied to education. Su

517 Direct Assessment and Interventions for Affective Skills Deficits (3) Theory, techniques and procedures shown to prevent and remedy academic skills deficits; application of curriculum-based assessment and direct intervention procedures. Su

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

520 Survey of Adult Education (3) Historical development, philosophies of adult education agencies, associations, programs, issues, and literature illustrating process of adult education and diversity of continuing education. Prereq: Consent of instructor. F

521 Program Development and Operation in Adult Education (3) Theories and methods from research to practice in planning and operating adult education programs. Prereq: Consent of instructor. Sp

522 Adult Development (3) Theory and research in adult development and change over lifespan and its implications for adult learning in formal and informal contexts. F

523 Post-Secondary Education for Adults (3) History, evolution, philosophy, structure and functions of post-secondary, sub-university institutions, their programs and clientele. Prereq: Consent of instructor.

524 Continuing Professional Education (3) Theories, concepts, and management of educational programs for adults in professions. Prereq: 520 or equivalent.

525 Characteristics of Adults Learners (3) Key characteristics of adult learners, current theory and research on adult learning, and implications for teaching and learning concepts. Sp

526 Informal Methods of Assessment (3) Development and use of rating scales, check-lists, observation, test scores and case reports in assessment and counseling of children and adults. Prereq: Counselor Education and Counseling Psychology 525, A

527 Controversies in Adult Education (3) Controversies confronting field of adult education; development of critical analysis skills by looking at controversies from different perspectives. Su

528 Psychology of Aging (3) Theory and research of aging and gerontology related issues: psychological and related physiological changes that occur in later life stages of human development. Implications for treatment programs and policies. Prereq: consent of instructor. F

529 Facilitating Adult Learning (3) Theory, research, and practice related to teaching with adult learners. Su

530 Methods of Collaborative Inquiry (3) Philosophical and theoretical frameworks for designing and conducting collaborative inquiry projects. Practice in conducting research. Sp

540 Seminar in School Psychology (3) Essentials of theory and practice of school psychology as professional specialty. Consideration of history and current issues in school psychology. F

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

542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to clients in learning environments. Coreq: 541 or consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. F, Sp

545 Psychoeducational Consultation (3) Use of two and three-person models of consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories. F

546 Practicum in Consultation (3) Application of consulting skills to educational settings. Prereq: 545. Sp

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

560 Discipline and Conflict Resolution (3) Application of major theories and models in discipline and conflict resolution in development of constructive atmosphere for classroom learning. Sp

572 Cognitive Education: Models and Approaches (3) Models and approaches in field of cognitive education: research and theoretical support for various program components, critical variables of organizational learning that affect success of implementation. Sp

573 Meeting Needs of Nontraditional and Underachieving Learners (3) Exploration of students’ needs at any age and level of functioning who are not progressing up to their fullest potential. Causes of academic and motivational problems, and approaches to overcome them. Learning to learn, cultural alienation, and personal world views and interaction with effective teaching and learning. Su

574 Facilitating Group Change (3) Practical issues of group change. Analyses of group and individual experiences in all types of educational settings in relationship to theory and collaborative learning concept. Theory. Needs of individuals and groups involved in change and roles of inside and outside change agents. F, So


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

600 Doctoral Research and 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/NC only. E

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

609 Advanced Seminar in Curriculum and Learning (3) Team-taught interdisciplinary seminar on trends, themes, and issues in curriculum and learning. Reading and discussions based on significant research and scholarly publications. Sp

612 Modes of Inquiry (3) (Same as Educational Administration and Policy Studies 612.) E

620 Seminar in Adult Education (3) Issues in adult education, theories and concepts, philosophical positions, research trends and methodologies. Prereq: 520 or equivalent. Sp

621 Advanced Seminar in Program Planning (3) Conceptual principles, and theories related to program planning in adult education. Prereq: 521 or equivalent. A

622 Advanced Seminar in Adult Development and Learning (3) Adult development and adult learning theory and research. Prereq: 522, 525, or equivalent. A


635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Psychology 635 and Counselor Education and Counseling Psychology 635.) F

640 Seminar in Applied Educational Psychology (2) Issues, theories, concepts and research in applied educational psychology. Prereq: Admission to Ph.D. in Education. May be repeated. Maximum 12 hrs. S/NC only. E

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

650 Professional Practice in School Psychology (1) Field setting to facilitate academic, social and professional development of children and adults. School and mental health settings for intervention, consultation, prevention, and assessment services. May be repeated. Maximum 9 hrs. S/NC only. F, Sp
655 Research in Psychoeducational Studies (1) Data analyses, collection, and interpretation. May be repeated. Maximum 9 hrs. S/N/C only. F,Sp

663 Scale Construction (3) Development, pilot testing, and revision of attitude inventories, rating scales, and other paper-and-pencil techniques for assessing beliefs, personality characteristics, and opinion. Prereq. Counselor Education and Counseling Psychology S52, 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

668 Practicum in Instructional Planning (3) Development and management of course or program of instruction in educational psychology. Prereq. 665, or consent of instructor. E

669 Internship in Educational Psychology (1-6) Supervised employment in unit approved educational psychology internship sites. May be repeated. Maximum 12 hrs. S/N/C only. E

671 Mediated Learning Theory (3) Feuerstein's theory of mediated learning experience and its connections to work of Piaget, Vygotsky and others. Implications for teaching and building of learning communities for learners of all ages. Prereq. Admission to doctoral program or consent of instructor. F

673 Collaborative Learning (3) Team taught, interactive course on collaborative learning theory related to professional practice. Integration of mediated learning theory with reflective practice related to furthering of collaborative learning in professional practice settings. Engagement of class members in collaborative learning. Prereq. 513 and 671 or consent of instructor. Sp

690 Psychopathology of Childhood (3) Descriptive and critical study of psychopathology of childhood and of systems of nomenclature applied to individuals with mental disorders: nomenclature provided in State Department of Education's Student Evaluation Manual and Diagnostic and Statistical Manual of Mental Disorders of American Psychiatric Association. Su

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

THE MASTER'S PROGRAM
Graduate work leading to the Master of Science with a major in Electrical Engineering may be completed during one academic year of full-time study, or two to three years of part-time study.

Admission Requirements
Applicants for admission to the M.S. degree program are expected to have completed a bachelor's degree in Electrical Engineering with an average of at least 3.0 out of 4.0 both overall and in the senior year. All applicants whose native language is not English, including those who have earned degrees at U.S. institutions, must score at least 550 on the TOEFL exam to be considered for admission to the program.

Students who hold the bachelor's degree 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. The department will require that selected undergraduate courses be taken to make the background of these students comparable to that of students who hold a bachelor's degree in Electrical Engineering. These undergraduate courses may include electrical engineering courses from the sophomore and junior years and one senior electrical engineering sequence of the student's choice. The specific set of undergraduate courses required will be chosen in view of the applicant's prior education and experience. The student will be admitted under non-degree status until the required undergraduate courses are successfully completed with a 3.0 average.

Master's Degree Requirements
Students may choose between a thesis option and a project (non-thesis) option M.S. program. All students must file a Master's Program Plan with the departmental graduate committee. Students may change between the thesis and project options, one time, by filing an amended Master's Program Plan.

Thesis Option: Specific requirements of the thesis option are a minimum of 30 semester hours including:
1. Electrical Engineering 503 and 504.
2. Six semester hours of mathematics at the 400 level or above selected from a list approved by the graduate committee, or 6 semester hours of EE courses at the 500 level or above, or 6 semester hours of non-EE courses approved by the student's master's committee and the graduate committee.
3. An additional 12 semester hours of 500-level work in electrical engineering including 8 semester hours in the student's major area of electrical engineering and 6 semester hours in a second area of electrical engineering approved by the student's master's committee.
5. A final oral examination covering the thesis and related coursework.

Electrical and Computer Engineering
(College of Engineering)

MAJOR DEGREES

Electrical Engineering............... M.S., Ph.D.

William T. Snyder, Interim Head

Professors:
Abidi, Mongi A., Ph.D...............Tennessee
Alexeff, Igor (Emeritus), PE, Ph.D. ......Wisconsin
Bailey, J. Milton, Ph.D., Emeritus, PE.
Ph.D. .......................................Georgia Tech
Birdwell, J. Douglas, Ph.D. ..........MT
Bishop, A. O. Jr. (Emeritus), Ph.D., Clemson
Bodenheimer, Robert E. (Emeritus),
Ph.D. ........................................Northwestern
Bose, Bimal K. (Condra Chair of Excellence),
Ph.D. ........................................Calcutta
Boulldin, Donald W, PE, Ph.D. ........Vanderbilt
Gonzalez, R. C. (Emeritus), Ph.D. ....Florida
Googe, Joseph M. (Emeritus), PE,
Ph.D. ...........................................Georgia Tech
Green, Walter L. (Emeritus),
Ph.D. ........................................Texas A & M

Hung, James C. (Emeritus), PE,
Ph.D. ........................................New York
Kennedy, Eldredge J. (Emeritus), PE,
Ph.D. ........................................Tennessee
Lawler, J. S., Ph.D. ..........Michigan State
Pace, Marshall O. (Liaison), PE,
Ph.D. ...........................................Georgia Tech
Pierce, J. Frank (Emeritus), PE,
Ph.D. ........................................Pittsburgh
Pujol, Alfonso Jr. (UTSI), Ph.D. ......Case Western
Roberts, M. J., Ph.D. .................Tennessee
Rochelle, Robert W. (Emeritus),
Ph.D. ........................................Maryland
Roth, J. Reece, Ph.D. ...............Cornell
Symonds, Frederick W. (Emeritus),
Ph.D. ........................................Nottingham
Tillman, James D. (Emeritus), Ph.D. ....Auburn

Associate Professors:
Bomar, Bruce W. (UTSI), Ph.D. ......Tennessee
Cryty, Paul B., Ph.D. ..............New Mexico State
Islam, Syed, Ph.D. ................Connecticut
Judson, R. D. (UTSI), Ph.D. ....Case Western
Koch, Daniel, Ph.D. ................Missouri (Rolla)
Kong, Seong-Gen, Ph.D. .............Southern Cal

Assistant Professors:
Chiasson, John, Ph.D. ..............Minnesota
Howlader, Mostofa, Ph.D. ........Virginia Tech
Peterson, Gregory,
Ph.D. ........................................Washington (St. Louis)
Qi, Hairong, Ph.D. .................NG State
Smith, L. Montgomery (UTSI),
Ph.D. ........................................ Tennessee
Smith, Philip W. .......................Virginia
Tolbert, Leon, Ph.D. ...............Georgia Tech

The Department of Electrical and Computer Engineering offers graduate degrees leading to the Master of Science and a Doctor of Philosophy with a major in Electrical Engineering. Graduate students are able to conduct research in a wide variety of electrical engineering areas including communication, computer engineering, computer vision and robotics, electromagnetics, electro-optics, image processing, information processing, intelligent control, microelectronics, mixed-signal VLSI, monolithic sensors, plasma engineering, power electronics and systems, sensor fusion, and signal processing.

The department sustains a strong joint program in mixed-signal VLSI and monolithic sensors with the Oak Ridge National Laboratory, Instrumentation and Controls Division. This program provides students with unique opportunities to receive career-related training at ORNL while satisfying thesis or dissertation requirements of the graduate program. Departmental graduate programs are also available at the Space Institute, Tullahoma. Further information about these various programs is available from the department.

The Departmental Graduate Committee is responsible for administering, promoting, and advancing the general well-being of the graduate program. Departmental actions regarding a graduate student may be appealed in writing, first to the departmental graduate committee and then to the department faculty.
Non-Thesis Option: Specific requirements of the project (non-thesis) option are a minimum of 33 semester hours including:
1. Electrical Engineering 503 and 504.
2. Six semester hours of mathematics at the 400 level or above selected from a list approved by the graduate committee, or 6 semester hours of EE courses at the 500 level or above, or 6 semester hours of non-EE courses approved by the student’s master’s committee and the graduate committee.
3. An additional 18 semester hours of 500-level work in electrical engineering courses, with at least 6 hours of 500-level work in each of two areas of electrical engineering.
4. Electrical Engineering 501 (project in lieu of thesis) with a minimum grade of B. This course will be administered by the student’s master’s committee. A written project proposal describing what the student will do in the course must be submitted in advance for the graduate committee’s approval. A written final report and oral presentation is required and one copy of the final draft must be submitted to the graduate committee.
5. A final written and oral examination covering the project and related coursework.

THE DOCTORAL PROGRAM

The Ph.D. degree program with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electromagnetics, electromagnetic theory, communication theory, operational amplifier theory, nuclear power plants, nuclear components, solid-state electronics, and control systems.

Applicants are required to submit scores on the Graduate Record Exam. A TOEFL score of 550 is required for non-native speakers of English, including those who have earned degrees at U.S. institutions. Specific departmental requirements for the Ph.D. include the following:
1. A Master of Science or Master of Engineering degree.
2. A minimum of 24 semester hours of coursework beyond the Master’s, excluding research and dissertation credit. These hours must include:
   a. A minimum of 12 semester hours in electrical engineering at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level coursework. At least 3 hours of this work must be in an area other than the student’s major area.
   c. A minimum of 6 hours of mathematics courses at the 500 level or above and approved by the electrical engineering graduate committee.
3. One foreign language if the student’s faculty committee feels that a reading knowledge of a foreign language is crucial to the student’s degree.
4. Satisfactory performance on a qualifying examination and on a comprehensive examination. The qualifying examination is prepared by the Electrical Engineering faculty and consists of two 4-hour written examinations. One part of the examination covers courses required in the undergraduate electrical engineering curriculum through the junior level. The qualifying examination is offered twice each year (January and August) and is to be taken the first time it is offered after the student enrolls in the program. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the program. A minimum of 18 hours of coursework must be completed after the student has taken the qualifying examination the first time.
5. A comprehensive examination is required by the Graduate Council. In this department the comprehensive exam is administered by the student’s committee; the exam results are reported to the graduate committee for approval; and the exam is filed in the department. The comprehensive exam is given when the student is ready to apply for admission to candidacy. The comprehensive exam consists of both written and oral parts. The written part consists of four 4-hour course sections: a complete review of the literature in the student’s dissertation topic, and a review of the major tools to be used in the dissertation work. The student’s committee may require additional written sections. The 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 committee may cover additional topics in the oral part.
6. Participation in departmental seminars.

GRADUATE COURSES

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

400 Senior Design (5) Major design project focusing student’s attention on professional practice, accumulated background, and systematic and experiential developments in field. Directed to topics within field of electrical engineering. Level 3 design projects which require laboratory work. Prereq: 316 Signals and Systems II, 325 Electronic Circuits, 342 Communications, 355 Computing System Fundamentals.
416 Computer Control Systems (4) Control computer control systems using state variables and z-transform model representations with sampling theory and its effect on digital control design. Design of digital controllers in both state space and frequency domain. Level 2 design projects. Prereq: 316 Signals and Systems II.
421 Electric Energy Systems (3) Structural and operation of electrical energy grid; load flow; economic dispatch; planning; control; reliability. Balanced and unbalanced faults; load flow; steady state and dynamic behaviors; the dq model; reference frames. Level 1 design projects. Prereq: 316 Signals and Systems II, 325 Electric Energy System Components.
423 Electric Machines (3) Principles of electromechanical energy conversion. Design procedures for AC and DC machine windings; construction and performance; and machine parameters of steady state and dynamic performances; the dq model; reference frames. Level 1 design projects. Prereq: 316 Signals and Systems II, 325 Electric Energy System Components.
432 Electronic Amplifiers (4) Feedback amplifier principles; wideband linear amplifier design; low-noise preamplifier design; audio power amplifier design; linear regulated power supply design and switching regulator principles. Radio frequency amplifier design; oscillator principles. Laboratory experiments and design projects. Level 2 design projects which require laboratory work. Prereq: 431.
441 Digital Communication (3) Quantization and pulse code modulation. Binary and M-ary signaling, spectra of line codes, link budget analysis, binary communication in presence of noise, matched filtering and equalization, and bandpass digital transmission, introduction to multiple access techniques. Level 1 design projects. Prereq: 342 Communications.
442 Communication System Design (4) Application of communication theory to system design. Development of communication system specifications. System simulation utilizing graphical programming languages. Hardware and software simulation. Construction and performance evaluation of complete analog or digital transmitter and receiver or significant subsystems. Level 2 design projects. Prereq: 441.
443 Antennas and Propagation (3) Introduction to antenna theory; fundamental antenna concepts and parameters (directivity, gain, patterns, etc.) and signal propagation. Theory and design of linear and loop antennas, arrays, and radiating elements. Level 2 design projects. Prereq: 316 Signals and Systems II, 341 Fields, 342 Communications.
453 Computer Network Design (4) Principles of communication and networking and design of network protocol: internet and TCP/IP protocol suite. Level 1 design projects that require laboratory work. Prereq: 206 Electrical and Computer Engineering.
471 Introduction to Pattern Recognition (3) Statistical decision theory, adaptive classifiers, and supervised and unsupervised learning. Application of techniques in areas of current interest: face recognition, speech processing, remote sensing, data mining and bioinformatics. Level 1 design projects. Prereq: 316
511 Linear Systems Theory (3) State space models of linear dynamical systems, linear algebra, state transition map, matrix exponential, controllability, observability, realization theory, and stability theory. Coreq: 507.

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


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

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

522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient and dynamic stability. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prerequisite: 521.

523 Power Electronics and Drives (3) Forced commutation inverters, drive system modeling, vector and scalar control of induction machines, parameter variations, control principles of synchronous machines. Prerequisite: 522.

524 High Voltage Systems (3) Phenomena, generation, measurement practices and insulation in high voltage circuits. Testing, surge and arc control, shielding, reliability. Prerequisite: 421.

531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices; semiconductor devices, J-FETs, and MOS-FETs. Small-signal equivalent circuits and noise models of active devices. Project laboratory. Prerequisites: 431, 432, or consent of instructor.

532 Advanced Analog Electronics II (3) Design and analysis of linear wide-band low-noise feedback amplifiers and radio-frequency amplifiers using discrete, monolithic and hybrid devices; voltage and current regulators, switching regulators. Use of specialized electronic systems in analog signal processors. Advanced topics from current literature. Project laboratory, Prerequisite: 531.

541 Electromagnetic Fields (3) Maxwell’s equations, scalar and vector potentials, EM fields and transmission, generalized media, guided waves, radiation from current elements. Prerequisite: Mathematics 404.


545 Introductory Microwave Networks and Components (3) Scattering and transfer representation for multiports; unilateral and bilateral microwave and millimeter wave devices. Component and system parameter measurement by modern network analyzers. Electronic oscillators and amplifiers, frequency sweeps, microwave diode, 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. Prerequisite: 551.
systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 617.

623 Advanced Power Electronics and Drives (3) Phase-controlled cycloconverters, cycloconvertered 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; associated statistics 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.

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


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

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

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

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

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

664 Advanced Plasma Physics II (3) Plasma heating and radiation phenomena. Advanced topics of current interest. Must be taken in sequence. Prereq: 663.

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

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

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

691 Advanced Graduate Seminar (1) Research in department. May be repeated. S/NC or letter grade. May be repeated. Maximum 9 hrs.

692 Special Topics (1-3) Advanced topics of current interest to Ph.D. students in Electrical Engineering. May be repeated. Maximum 9 hrs.

693 Advanced Graduate Seminar (1) Rotation in department. May be repeated. 693.
Capstone Experience Requirement: An integral part of all options in the master's degree program in English is a capstone experience which allows the student to synthesize and apply the knowledge and skills gained through the completion of the program in a substantial way. Examples of capstone experiences include, but are not limited to, the completion of a thesis or the formal public presentation of a paper at a professional meeting or departmental colloquium. All capstone experiences normally occur after the completion of 24 hours of coursework and must be approved by the Director of Graduate Studies.

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

A non-thesis student must pass a written examination, followed by a one-hour oral examination, both consisting of the same sort of questions as the examination taken by the thesis student.

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

WRITING CONCENTRATION

The master's program with writing concentration is intended for those students who plan to do 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 proper level. Of the courses in writing, at least 3 hours must be taken at the 500 level; additional 500-level courses are strongly recommended.

Writing Projects: One of the following writing projects for six hours of credit: 1. A thesis, using research to analyze some aspect of writing or rhetorical theory. 2. A creative project, such as a collection of poems or short stories, a short novel, a play, or a creative work of non-fiction prose. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and the project director. In addition to the director, two other English Department faculty members will supervise and approve the project; at least one should be from the literature faculty. Final Examination: The reading list may be modified by the M.A. examining committee, meeting as a body with the student, to reflect the candidate's particular writing emphasis. However, most of the oral examination should focus upon the literature outlined in the original reading list.

THE DOCTORAL PROGRAM

Requirements

A student must successfully complete a program of study, normally 6 full semesters as outlined below, approved by the candidate's committee or the Director of Graduate Studies in English.

Coursework: At least 54 semester hours beyond the B.A. (of which at least 24 semester hours must be beyond the M.A.) to include at least 21 semester hours at the 600 level; at least 15 semester hours at the 500 level or above (only 3 hours of 593 Independent Study may be applied toward the M.A. and 3 after the M.A.); a 3-hour course in teaching composition; and 15 additional hours at any level approved for graduate credit (including a maximum of 12 hours at the 400 level if approved by the Director of Graduate Studies).

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

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

Language Requirement: A language requirement met in one of the following ways:

1. Two languages approved by the Director of Graduate Studies in English. The requirement for each language may be fulfilled by (a) completion of French 302 or German 332 with a grade of B or better; (b) completion at UT of any two courses on the 300 level or above in the foreign language or literature with at least a grade of B in each course; (c) passing of the regular Ph.D. foreign language examination as currently administered at UT.

2. One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade on the language examination given by UT and completion of two courses 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) of 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 qualifying examination taken before the end of the first year of Ph.D. coursework; this examination is given three times a year, with the M.A. written examination. (2) A comprehensive written examination which may be divided as the department directs; see the English Department graduate brochure. The comprehensive examination is given twice a year, normally in March and September. Before a student may take it, he/she must have completed all coursework required. A student must also have met all requirements for foreign languages before beginning the first part of the 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 assistanthips, full-time consists of 9 or more hours of coursework and/or dissertation hours each semester. For students on assistanthips, 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 316 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 Cressida in Middle English.

404 Shakespeare I: Early Plays (3) Shakespeare's dramatic achievement between 1589 and 1600, focusing on the development and discussion of selected plays from romantic comedies, including Twelfth Night; English histories, including Henry IV, and early tragedy, including Hamlet.

405 Shakespeare II: Later Plays (3) Shakespeare's dramatic achievement between 1601 and 1613, focusing on the development 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 1590 and 1640 through reading of representative plays by Shakespeare's contemporaries: Marlowe, Webster, Jonson.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

435 American Novel before 1900 (3) From earliest 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 humors, local color writers, and Southern literary renaissance.

442 American Humor (3) Early nineteenth century to twentieth century: Mark Twain.

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

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

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

453 Contemporary Drama (3) Survey of British, American, and international drama since World War II.

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

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

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

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

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

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

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

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

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

471 Sociolinguistics (3) Study of language in relation to society. Empirical and theoretical approaches. Language and social identity; language and community; language and ethnicity; language and regional variation. Prereq: 371 or Linguistics 200 or consent of instructor. (Same as Linguistics 471 and Sociology 471.)

472 American English (3) Phonological, morpho-syntactic, and pragmatic characteristics of American English; phonetics, functions, and implications for cultural pluralism. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 472.)

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

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

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

477 Pedagogical Grammar for ESL Teachers (3) Aspects of English syntax and morphology presenting difficulties for non-native learners of English. Basic and complex sentence structures of the English language. (Same as Linguistics 475.)

478 Literacy in American English (3) Historical survey of major works of literary criticism.

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

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

482 Major Authors (3) Content varies. Concentrated study of at least one of the most influential writers in British or American literary history: e.g., Donne, Pope, Austen, Tennyson, Whitman, Faulkner, Lawrence, Baldwin, or Morrison.

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. May be repeated with consent of department. Maximum 6 hrs.

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

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

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

496 Rhetoric of Legal Discourse (3) Application of rhetorical analysis to legal materials. Focus on issue identification and argument through written position papers, briefs, and memoranda. Critical reading and discussion. Introductory research techniques. No prior legal knowledge necessary. Prereq: Advanced Expository Writing or consent of instructor. (Same as Legal Studies 496.)

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

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

503 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, proficiency in English teaching, theoretical and practical 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 historically analyzed literary modalities, genres, and prose fiction. May be repeated. Maximum 6 hrs.

508 History of the English Language I (3) Phonological, morphological, and syntactic development of English language: Old and Middle English. 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 (3,3) Reading and analysis of selected masterpieces of Old and Middle English literature and their Continental sources in Modern English. May be repeated. Maximum 9 hrs.

520-21 Readings and Analysis in Selected Areas of Sixteenth- and Seventeenth-Century Prose, Poetry, and Drama (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs. each.

530-31 Readings in English Literature of the Restoration and Eighteenth Century (3,3) Topics vary. Genre: poetry, prose, fiction, drama; or period: Restoration, eighteenth century. May be repeated. Maximum 9 hrs. each.

540-41 Readings in English Literature of the Nineteenth Century I and II (3,3) Content varies: genre,
Seminar in text, inter-repeated. Maximum 9 hrs. each.

550-51 Readings in American Literature (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs.

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

560-61 Readings in Twentieth-Century Literature (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis. May be repeated. Maximum 9 hrs. each.

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

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

581 Colloquium in Poetry Writing (3) Major poetic project or continuation of project begun in 463. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prereq: 463 or consent of instructor. May be repeated. Maximum 6 hrs.

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

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

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

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

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

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

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

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

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

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

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

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

594 Film History, Form, and Analysis (3) Issues in film studies; history of narrative film; concept of film form; critical approaches to film study (genre, auteur, formalist, and others); and critical analysis of individual films.

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

610 Studies in Old English Language and Literature (3) Old English grammar with readings in prose and poetry. F,A

611 Studies in Beowulf (3) Translation and critical study of Beowulf. Prereq: English 610 or consent of instructor. Sp,A

620 Studies in Medieval English Literature (3) Seminar in literature and literary genres of Medieval English literature, read in Old and Middle English. Subject matter varies from year to year. May be repeated. Maximum 9 hrs.

621 Studies in Chaucer (3) Seminar in text, interpretation, and criticism of Chaucer’s writings. Prereq: Previous course in Chaucer. May be repeated. Maximum 6 hrs.


650 Studies in English Romanticism (3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.

651-52 Studies in Victorian Literature (3,3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.

660-61-62 Studies in American Literature (3,3,3) Southern literature before 1830, frontier, regionalism, women’s literature, Irving, Cooper, Poe, Emerson, Thoreau, Hawthorne, Melville, Whitman, Dickinson, James, and Twain. May be repeated. Maximum 9 hrs. each.

670-71-72 Studies in Twentieth-Century Literature (3,3,3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus. May be repeated. Maximum 9 hrs. each.

680 Topics in English Language (3) May be repeated with consent of director of graduate studies. Maximum 9 hrs.

682 Studies in Rhetoric and Composition (3) Content varies. Advanced work in theory and/or history of rhetoric and composition. Issues in invention, textuality, literacy, historiography, style and ethics. May be repeated. Maximum 9 hrs.

686 Studies in Creative Writing (3) Content varies. Connection between theory and practice in writing. May be repeated. Maximum 9 hrs.


690 Special Topics (3) Content varies. History of ideas, humor, biography, autobiography, extra-literary disciplines. May be repeated. Maximum 9 hrs.

694 Studies in Film (3) Content varies. Advanced work in film history and analyses. May be repeated. Maximum 6 hrs.

Entomology and Plant Pathology

(ADMISSION REQUIREMENTS)

Gregory A. Brown, Ph.D. ....................... North Carolina State University

The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a concentration in entomology or plant pathology. Students in entomology may specialize in crop entomology, medical and veterinary entomology, insect biology, insect pest management, or biological control. Students in plant pathology may specialize in foliar and stem fungus diseases, soilborne pathogens, disease physiology, biocontrol, plant nematology, or virology. For specific information, contact the department head.

THE MASTER'S PROGRAM

Admission Requirements

For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate Council and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) general inorganic chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

Degree Requirements

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student’s advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be passed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

GRADUATE COURSES

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

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

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during
Exercise Science and Sport Management

(College of Education)

MAJORS

DEGREES

Education ........................................ Ph.D.
Human Performance and Sport Studies .. M.S.

Edward T. Howley, Head

Professors:

Bassett, David R., Jr., Ph.D. ............... Wisconsin
Beitel, Patricia A. (Emeritus), Ed.D. ......, North Carolina (Greensboro)
Howley, Edward T., Ph.D. ......... Wisconsin
Kozar, Andrew J. (University Prof.), Ph.D. ................. Michigan
Lay, Nancy E. (Emeritus), Ph.D. .. Florida State
Liemohn, W. P., Ph.D. ................. Iowa
Rockett, Ian R. H., Ph.D. ............. Brown
Watson, Helen B. (Emeritus), Ph.D. .... Michigan
Welch, Hugh (Emeritus), Ph.D. ....... Florida

Associate Professors:

Jones, Ralph E., Ph.D. ................. Toledo
Kelley, Dennis R., Ph.D. .............. Georgia State
Thompson, Dixie L., Ph.D. ............. Virginia

Assistant Professors:

Hardin, Robin, Ph.D. ................. Tennessee
McCutchen, M. G., Ed.D. ...... North Carolina (Greensboro)
Stratta, Terese, Ph.D. .............. Southern Illinois
Zhang, Songning, Ph.D. ......... Oregon

The Department of Exercise Science and Sport Management offers graduate programs leading to degrees, majors, and concentrations in:

Master of Science

Human Performance and Sport Studies

Exercise science (exercise physiology; biomechanics/sports medicine)
Sport management

Doctor of Philosophy

Education

Exercise science

See Education under Fields of Instruction for full description of all degree requirements. The exercise science concentration promotes and integrates scientific research, education, and practical applications of exercise science to maintain and enhance health, fitness, performance, and quality of life. The department offers an undergraduate major in Exercise Science that will prepare students for careers in fitness and provide the science-based background needed for application to graduate programs in biomechanics, physical therapy, cardiac rehabilitation, public health, exercise physiology, athletic training, or public school teaching. Graduate students and faculty focus on research dealing with theoretical and applied aspects of exercise and sport.

The sport management concentration provides the opportunity for students to attain knowledge and to develop the essential skills to be successful sport managers. In addition, the department coordinates and provides instruction in many physical activities designed to improve physical fitness and encourage future participation in lifetime sports. Elective courses are offered in dance. These courses are appropriate for students interested in management of dance studios, teaching dance, or dance performance.

ADMISSION REQUIREMENTS

Applicants are required to complete the departmental application which will be sent to all persons upon their initial inquiry about the program. This is in addition to the Graduate Application for Admission. Applications from persons who have less than a 3.0 GPA will not be considered.

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

1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who 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 ASSISTANTSHIPS

A limited number of graduate assistantships are available for qualified women and men who are graduates of accredited colleges or universities. These assistantships are open to students in the master's and doctoral programs. Students interested in these opportunities should file their applications before February. Letters should be addressed to Graduate Assistantships Coordinator, Exercise Science and Sport Management Department, The University of Tennessee, Knoxville, TN 37996-2700.
Exercise Science

GRADUATE COURSES

480 Physiology of Exercise (3) Functions of body in muscular work; physiological aspects of fatigue, training and adaptation to environment. Prereq: Biochemistry and Cellular and Molecular Biology 230 Human Physiology or 440 General Physiology. (Same as Biochemistry and Cellular and Molecular Biology 480.)

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

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

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


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

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


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

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

521 Analytic Epidemiology (3) Epidemiologic strategies for evaluating research questions concerning causes, prevention and treatment of morbidity and disability. Presentations by experts working with large population-based datasets. Research process: grant writing and protocol preparation. Prereq: Course in statistics or consent of instructor.

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


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

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

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

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


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

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

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

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Counselor Education and Counseling Psychology 585, Nursing 585, Public Health 585, Educational Psychology 585, Social Work 585, and Sociology 585.)

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

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

601 Research Seminar in Exercise Science (1) Research topics in different aspects of exercise science. May be repeated. S/NC only.

622 Directed Independent Research (3-6) Prereq: Doctoral student or consent of instructor. May be repeated. S/NC or letter grade.

625 Mortality and Survival (3) Life table and other population-based approaches to studying international and sociodemographic patterns and differentials in mortality, morbidity, and longevity. Prereq: Graduate statistics courses or consent of instructor.

635 Physical Activity and Positive Health (3) Review of clinical, epidemiological, and experimental evidence concerning relationship and effects of exercise on health-related components of fitness. Prereq: Elementary statistics, 480 or 533 and 567 or consent of instructor. (Same as Public Health 635.)

661 Seminar in Exercise and Applied Physiology (1-3) Selected topics in exercise and environmental physiology. Prereq: 480 or 533. May be repeated with consent of instructor.

664 Research Participation in Exercise Science (1-6) Participation in research with faculty member whose interests coincide with those of student. S/NC only.

681 Practicum (1-3) Internship experience in areas of major interest. May be repeated.

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

440 Sport Marketing (3) Application of fundamental marketing concepts to sport industry. Marketing research, promotions, fund raising, advertising, and assessment of marketing programs specific to sport. Historical development of sport marketing. Prereq: Marketing or consent of instructor.

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

501 Special Project (3) Culumnating experience for non-thesis major. Research study suitable for publication, or practicum requiring special written work. Prereq: 533.

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


511 Administration/Supervision In Sport (3) Development of knowledge and analytic skills desirable for managers/administrators in sport business/organization: organizational, administrative, and supervisory strategies related to sport in profit and non-profit settings. Su

512 Application of Legal Concepts to Sport Settings (3) Application of contract law, breach of contract, and monetary damages within sport settings: risk assessment and development of effective risk management strategies; development of contracts in sports; and analysis of cases involving discrimination based upon gender, race, and age as well as protection of rights at amateur and professional levels of sport. Sp

530 Sport and Media Issues (3) Gender and race issues within context of media and sport. Development of sport media and influence on sport. F,Sp

532 Research Techniques in Sport (3) Evaluate, compare, and contrast research techniques in sport with consideration for and experiences in appropriate review, design, analysis procedures, and proposal development. F,Su

535 Ethics in Sport Administration (3) Development of ethical skills and knowledge desirable of middle and upper level managers in sport business/organizations. Social issues and ethics in sport administration. Sp

540 Sport Economics and Finance (3) Principles of economics and finance as applied to sport organizations. Market structures of sport finance and political economics that form those structures.

544 Theories of Leadership and Leader Behavior in Sport (3) Integration of various theoretical approaches to leadership styles in sport administration within cultural contexts, research, and field experiences. Sp

553 Case Studies in Sport Administration (3) Current issues and problems in sport administration at all levels of amateur and professional sport. May be repeated under different topics. Maximum 9 hrs.

554 Readings in Sport Administration (3) Survey of pertinent literature in refereed and applied journals and texts. Su

555 Evaluation Techniques for Sport Managers (3) Review and application of techniques of evaluation appropriate for sport programs, facilities, and personnel. Sp

570 Event Management (3) Review of current research related to theory and practice in event management and involvement in management capacity with one or more special events. Sp

575 Seminar in Sport Management (1) Selected topics in sport management. May be repeated with consent of instructor. Maximum 3 hrs. S/NC only.

580 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. May be repeated.

590 Practicum (3) Practical experience in areas of major interest. May be repeated. Maximum 6 hrs. S/NC only.
Finance

College of Business Administration

MAJOR DEGREES

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

James W. Wansley, Head

Professors:
Black, Harold A. (James F. Smith, Jr., Prof.), Ph.D. ... Ohio State
Boehm, Thomas P. (AmSouth Scholar), Ph.D. ........ Washington (St. Louis)
DeGennaro, Ramon P., Ph.D. ........ Ohio State
Dorsetweich, William W. (Emeritus), Ph.D. ........ Pennsylvania
Ehrhardt, Michael C. (Castagna Prof.), Ph.D. .... Georgia Tech
Filippatos, George C. (Distinguished Prof.), Ph.D. ... New York
Shives, Ronald E. (Voight Prof.), Ph.D. .......... UCLA
Wachowicz, John M., Jr. (AmSouth Scholar), CPA, Ph.D. ....... Illinois
Wansley, James W. (Clayton Homes Chair of Excellence) (Liaison), CFA, Ph.D. .... South Carolina

Associate Professors:
Auxier, A1 L., Ph.D. ......... Iowa
Collins, M. Cary (Home Federal Fellow), Ph.D. ............. Georgia
Daves, Phillip R., Ph.D. ...... North Carolina
Murphy, Deborah L., Ph.D. .... Florida

BUSINESS ADMINISTRATION CONCENTRATIONS

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

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

Minimum course requirements are three courses: 511 plus two from the following: 512, 525, 532, 581, and 599 (Torch Fund only).
Ph.D. Concentration: Finance.
Minimum course requirements are finance seminars 641, 642, 651, 652.

GRADUATE COURSES

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

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

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

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


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

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

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

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

641 Seminar in Finance (1-3) Capital markets, utility theory, asset pricing, theory of the firm, capital structure, dividend policy. Prereq: Consent of instructor. S/NC or letter grade.


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


Food Science and Technology

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREES

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

Clark J. Brekke, Head

Professors:
Brekke, Clark J., Ph.D. .................. Wisconsin
Collins, Jim L. (Emeritus), Ph.D. ....... Maryland
Davidson, P. Michael, Ph.D. .......... Washington State
Drughon, F. Ann, Ph.D. ............... Georgia
Jaynes, Hugh O. (Emeritus), Ph.D. .... Illinois
Melton, Sharon L. (Emeritus), Ph.D. ... Tennessee

Associate Professors:
Miles, James T. (Emeritus), Ph.D. ....... Wisconsin
Morris, William C., Ph.D. .............. Iowa State
Overcast, Woodrow W. (Emeritus), Ph.D. .................. Iowa State
Penfield, Marjorie P., Ph.D. .......... Tennessee

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

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

THE MASTER’S PROGRAM

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

Thesis Option

1. Prior to research for the thesis, the student must develop a detailed written
and oral comprehensive examinations prior to 500 Thesis is required.

2. In addition to the thesis requirement, a minimum of 24 semester hours of graduate coursework is required. This work must be approved by the student’s committee and a minimum of 14 hours must be courses numbered above 500. The committee may require additional coursework if the student’s progress or background indicates such need.

3. All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their master’s program. Completion of 510 or equivalent is also required.

4. An oral, final examination covering the thesis and coursework is required.

Non-Thesis Option

1. In lieu of a thesis, students are required to complete a problem in cooperation with their employer (company or governmental agency) and their faculty committee. Students working on a problem must register for 6 hours of 503.

2. In addition to the requirement for 6 hours of 503, a minimum of 24 semester hours of graduate coursework is required. This work must be approved by the student’s committee and a minimum of 14 hours must be courses numbered above 500. The committee may require additional coursework if the student’s progress or background indicates such need.

3. All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their master’s program. Completion of 510 or equivalent is also required.

4. Students will be required to take a written comprehensive examination covering their coursework. In addition, an oral, final examination covering the problem and coursework is required. The oral examination will be held on the Knoxville campus.

THE DOCTORAL PROGRAM

1. Completion of a master’s degree in the field, or a closely related field, or passing a special qualifying examination is required for admission.


3. A minimum of 72 hours beyond the Bachelor’s degree, excluding credit for the master’s thesis, is required. Of this, 24 semester hours must be 600 Doctoral Research and Dissertation.

4. At least 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 500.

5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Science and Technology.

6. All candidates must complete 601 (2 hrs.) and are expected to attend 601 during their Ph.D. program.

7. Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. Major professors will advise candidates on competencies expected. A final oral examination is required that includes a defense of the dissertation and subject matter that the student’s committee considers appropriate.

GRADUATE COURSES

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

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

429 Food Microbiology Lab (3) Methods for examination, enumeration, cultivation and identification of foodborne microorganisms. Prereq: Microbiology 210 General Microbiology. Coreq: 420. F

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

460 Meat Science (3) Carcass characteristics of meat animals, muscle structure and composition, cut identification, curing, freezing and cookery. Prereq: Food Industry or consent of instructor. Sp

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

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

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

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

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

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

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

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

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

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

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

515 Food Carbohydrates, Proteins and Lipids (4) Advanced study of chemical and physical attributes of carbohydrate, protein, and lipid components of foods; effects of components on production of safe and consistent quality food products; and changes during processing and/or distribution of food products. Prereq: Food Chemistry or equivalent. 3 hrs and 1 lab. Sp

521 Advanced Food Microbiology (3) Extrinsic and intrinsic factors associated with foods and food processing that relate to growth, survival, inhibition, detection, and recovery of foodborne pathogens and spoilage organisms; traditional and current approaches to microbiological food safety and quality. Prereq: Food Microbiology and Lab or equivalent. Sp,A

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

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

590 Special Topics in Food Technology and Science (1-3) Critical reviews of current research and production concerns of food industry. May be repeated. Maximum 9 hrs. F,Sp

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

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

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

620 Food Toxicology (3) Basic and applied concepts in food toxicology; toxicological aspects of processed foods. Mode of action, prevention and control of food toxicants in food supply. Prereq: Food Chemistry, 521, or consent of instructor. Sp,A

640 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, flavor and color characteristics. Prereq: Food Preservation, 510, 511, 512 or consent of instructor. Sp,A

Forestry, Wildlife and Fisheries

(Majors: MAJORS DEGREES

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

George M. Hopper, Head

Professors:


Speer, C. A., Ph.D. .......... Utah State
Strange, R. J., Ph.D. .......... Oregon State
Stumbo, D. A. (Emeritus), Ph.D. .... Minnesota
Thor, E. (Emeritus), Ph.D. .... NC State
Wilson, J. L., Ph.D. .......... Tennessee

Associate Professors:
Buehler, D. A., Ph.D. .......... Virginia Tech
Clark, J. D., Ph.D. .......... Arkansas
Clatterbuck, W. K., Ph.D. .... Mississippi State
Fly, J. M., Ph.D. .......... Michigan
Hay, R. L., Ph.D. .......... Duke
Hodges, D. G., Ph.D. .......... Georgia

Assistant Professors:
Bond, B. H., Ph.D. .......... Virginia Tech
Buckley, D. S., Ph.D. .......... Michigan Tech
Harper, C. A., Ph.D. .......... Clemson
King, S. L., Ph.D. .......... Texas A&M
Knowe, S. A., Ph.D. .......... Georgia
Muller, L. I., Ph.D. .......... Georgia
Van Manen, F. T., Ph.D. .......... Tennessee
Wang, S. Ph.D. .......... Nanjing Forestry (China)
Young, T. M., M.S. .......... Tennessee

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science and the Doctor of Philosophy with a major in Natural Resources is offered by the Department of Forestry, Wildlife and Fisheries.

The mission of the Department of Forestry, Wildlife and Fisheries is to advance the management, utilization, and appreciation of natural resources in Tennessee, the region and beyond through programs in teaching, research and extension.

THE MASTER'S PROGRAMS

Both thesis and non-thesis options are available for the major in Forestry; a thesis is required in Wildlife and Fisheries Science.

For admission, the student must have a Bachelor's degree from an accredited institution in forestry, wildlife, fisheries, or other natural resource area. Applicants must take the general Graduate Record Examination (GRE) with minimum scores required.

Graduate Rating Forms or letters of recommendation 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 Office of Graduate Admissions.

Thesis Option

1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for 6 hours of Thesis (Forestry 500 or Wildlife and Fisheries Science 500) is required.

2. A graduate committee of no fewer than 3 faculty members must be selected by the second semester of residence. At least one member shall be from outside the department. In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student's committee and no more than 10 hours of the minimum 30 can be below the 500 level. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to include Forestry 512 or Wildlife and Fisheries Science 512, Seminar, in their programs. This is required of each graduate student in residence fall semester.

4. An oral examination covering the thesis and coursework is required.

Non-Thesis Option (Forestry only)

1. Thirty-five hours of graduate coursework of which 23 must be at the 500 level or above is required.

2. A graduate committee of no fewer than 3 faculty members will be selected. At least one member shall be from outside the department. The committee will meet and schedule the student's program 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.

THE DOCTORAL PROGRAM

The doctoral program with a major in Natural Resources emphasizes interdisciplinary research approaches toward the understanding and management of natural resources in a broad context. Areas of study include forest, wildlife, and fisheries biology; ecosystem function and structure; natural resource economics and policy; human dimensions of natural resource management; natural resource organization administration and management; wood sciences; and multidisciplinary natural resources management.

Admission Requirements

Applicants to the Ph.D. program normally should have completed a master's degree prior to beginning the doctoral program. Specific admission requirements include:

1. A minimum grade-point average of 3.0 on a 4.0 scale.

2. A minimum composite score from the general Graduate Record Examination (GRE) on the verbal, quantitative, and analytical sections of 1500, with a minimum of 1100 on the verbal and quantitative sections.

3. A statement of professional goals, natural resource management philosophy, and reasons for applying to the program.

4. Three letters of reference from individuals capable of evaluating the applicant's potential for graduate work in interdisciplinary natural resource management.

Degree Requirements

A candidate for the doctoral degree must complete 72 semester hours of coursework beyond the bachelor's degree. Forty-eight hours must be in graduate coursework approved by the student's doctoral committee. Up to 24 hours of master's-level coursework may be applied to the 48-hour requirement. A minimum of 6 hours must be taken in UT courses at the 600-level exclusive of dissertation hours. Specific requirements are:

1. Research Methods and Analysis (9 credits in at least two of the subject areas) Research/Experimental Design Statistics/Econometrics/Biometrics GIS/Remote Sensing

2. Core Subject areas (33 credits to be determined by Doctoral Committee)

3. Professional Development (6 credits) Teaching - All students will be expected to complete FWF 601 and assist in teaching a course during their tenure in the program. Problem Solving – FWF 610 will be required of all doctoral students that will include participation in an interdisciplinary team to address a significant national or regional natural resource issue.

Professional Communications – all students will be required to complete FWF 612 as part of their program of study. Part of the seminar requirement will consist of assisting in the development and conduct of FWF 512.

4. FWF 600 Doctoral Research and Dissertation (24 credits)

A doctoral committee consisting of at least four faculty members must be identified by the student and major professor. At least two of the committee members must be from the Department of Forestry, Wildlife and Fisheries and one member must be from an academic unit other than Forestry, Wildlife and Fisheries. Three of the committee members, including the major professor, must be approved by the Graduate Council to direct doctoral research. The committee should be formed during the first year of the student's program.

All students are required to successfully complete an oral and written examination on all coursework completed as part of the Ph.D. requirements. The exam is scheduled when the student has completed all or nearly all of the coursework. The Ph.D. committee will determine the content, nature, and schedule of the comprehensive exam and certify the results.

During the first year, the student should develop a research prospectus that outlines the research problem to be addressed as part of his/her doctoral research. The prospectus is presented to the student's committee and the committee will approve the research topic and approach.

All students are required to complete, present, and defend a dissertation. The student should provide each member of the committee a copy of the dissertation at least two weeks prior to the scheduled defense. All students are required to present a seminar on their dissertation as part of the degree requirements. The seminar can be part of the dissertation defense or presented before the formal defense.

MINOR IN ENVIRONMENTAL POLICY

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

GRADUATE COURSES

421 Forest and Wildland Resource Economics (3) Production functions, supply-demand and market analysis; non-market programs and projects; economic analysis and decision models; investment and financial analysis; managerial economics; taxes; forest products marketing. Prereq: Forest Resource Analysis or consent of instructor. F, A

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

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

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

434 Wood Processing and Machining (2) Primary log breakdown and secondary processing into major products. Fundamentals of machining technology for major types of cutting operations: sawing, boring, planing, veneer cutting and laser machining; day field trips. Prereq: Wood Properties and Uses and Wood Identification, or consent of instructor. 1 hr and 2 labs. Sp

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

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/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. Topic and report must have approval of graduate committee. Open 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 in fall. May be repeated. Maximum 2 hrs. S/N/C only. F

515 Forest Conservation Workshop (1-3) Relation of forest biology, ecology and management strategies. Not available to students in forestry or wildlife and fisheries science. May be repeated. Maximum 3 hrs. Su,F

520 Advanced Forest Ecology (3) Physiological ecology and adaptations of trees; relationships between overstory structure, microclimate, and understory response; regeneration ecology; competition and effects of natural and human disturbance regimes at multiple scales; forest succession and stand dynamics. Prereq: Forest Resource Analysis or consent of instructor. Sp,A

525 Woodlot Management (3) Current technologies and management strategies concerning wise use of forest resources for private, non-industrial forest landowners. Case studies on forest planning and implementation. Prereq: 6 hrs of biological sciences or consent of instructor. Not available to students in forestry or wildlife and fisheries science. 6.5 hrs and 1 lab weekly for 6 weeks. Sp, A

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

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection of superior phenotypes; field testing for genetic variability; tree breeding; development of new forest tree genetic resources; and tissue culture; use of biochemical variation, planning and conducting forest genetics research. Prereq: Silvicultural methods and Biology 220 or consent of instructor. Sp,A

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

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

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commonly important woodlands and softwoods. In-depth analyses of silvicultural principles involved and tools used, prescribed fire, pesticides, in regeneration and management; computer model of stand dynamics, structure, growth-yield. Prereq: Undergraduate silviculture course or consent of instructor. 2 hrs and 1 lab. Sp,A

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory; fixed and variable plot sampling; list sampling; Poisson sampling; regression estimators; multistage and multi-phase sampling. Growth and yield prediction of even-aged and uneven-aged forests. Prereq: Land Measurement Techniques and Forest Resource Inventory or consent of instructor. F

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

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

630 Forest Growth and Development (3) Forest stand dynamics, analysis of changes in species composition and forest form over time, including spatial and temporal aspects. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. F,A

650 Advanced Forest Management (3) Recent advances and concepts, research techniques, and analysis of current problems. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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. Weekend field trips. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. Applicable to majors in Forestry and in Wildlife and Fisheries Science. 2 hrs and 1 lab. F

416 Planning and Management of Forest, Wildlife and Fisheries Resources (3) Integrated forest and wildlife management; regional development of forest land management plans and analyzing case studies including conflict resolution. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Prereq: Senior standing 1 hr and 2 labs. Sp

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

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 methodologies to mitigate environmental problems: open enrollment. Prereq: 416 or equivalent or consent of instructor. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Sp,A

540 Seminar on Integrated Resources Management in Biosphere Reserves (2) MAB program, UNESCO-sanctioned global conservation initiative. Analysis of integrated resources management practices that demonstrate concept of sustainable development. Environmental policy and application of science to management practice. Applicable to majors in Forestry and in Wildlife and Fisheries Science. Sp,A

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

600 Doctoral Research and Dissertation (1-5) P/NP only. E


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

612 Seminar in Forestry, Wildlife and Fisheries (1) Current issues and developments in forestry, wildlife and fisheries. Required of all doctoral students in residence during fall. May be repeated. Maximum 3hrs.

Wildlife and Fisheries Science

GRADUATE COURSES

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

442 Fisheries Techniques (3) Active and passive sampling techniques for fish; anurans; population estimation methods; fish handling and transport; food habits analysis; marking and tagging techniques; age determination and growth analysis; stream assessment; equipment and instrumentation usage and maintenance; safety in sampling methods. Weekend field trip. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 1 hr and 1 lab or field. 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 consent of instructor. 2 hrs and 1 lab. Sp

ment or consent of instructor, 2 hrs and 1 lab. One weekend field trip required. Sp

445 Ecology and Management of Wild Birds (3) Biological and ecological characteristics of game birds, endangered birds, and bird pests. Current principles and practices of wild bird management. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 2 hrs and 1 lab. 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 perspective of ethical behavior in practices of wildlife and fisheries management. Lectures, panel discussions, and case studies. Team taught. Prereq: Senior standing. S/NC only. Sp

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

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

512 Seminar in Wildlife and Fisheries Science (1) Current developments in wildlife and fisheries science. Required of all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/NC only. F

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

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 wildlife and plant species. Historic aspects, policy implications and philosophical issues surrounding recovery efforts. Approaches to monitor and manage for biodiversity. Prereq: Graduate standing or consent of instructor. Sp,A

530 Wildlife Diseases (2) Necropsy of birds and mammals. Review of various diseases and procedures of preparing pathological materials in field and lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr biology, 444 or 445, or consent of instructor. Same as Comparative and Experimental Medicine - Veterinary Medicine 530. F,A

535 Floodplain Ecosystems (3) Ecology, restoration and management of floodplain ecosystems: biotic and abiotic processes, social considerations, and wildlife and forest management; Lower Mississippi River Alluvial Valley. Prereq: Consent of instructor. F, A

540 Predator Ecology (2) Dynamics of terrestrial vertebrate predator populations in human-altered and relatively undisturbed environments. Prereq: 444 or 445 or consent of instructor. Sp,A

545 Advanced Population Analysis (2) Detail characteristics, assumptions, goals, methods, and current technologies for fish and wildlife population analysis. Use of computers. Prereq: Animal Science 571 or Statistics 538 or consent of instructor. Sp, A

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

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

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

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

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

French

See Modern Foreign Languages and Literatures

Geography

(College of Arts and Sciences)

MAJOR REQUIREMENTS

DEGREES

Geography .............................................. M.S., Ph.D.

Bruce Ralston, Head

Professors:

Aiken, Charles S., Ph.D. ......................... Georgia
Bell, Thomas L., Ph.D. ....................... Iowa
Forest, Ronald, Ph.D. .................. Rutgers
Hammond, E. H. (Emeritus), Ph.D. ... California
Harden, Carol P., Ph.D. .................. Colorado
Hor, Sally P., Ph.D. ....................... California
Jumper, Sidney R. (Liaison), Ph.D. .... Tennessee
Long, Robert G. (Emeritus), Ph.D. .... Washington

Minkel, C. W., Ph.D. ....................... Syracuse
Pulsipher, Lydia, Ph.D. ............... Southern Illinois
Ralston, Bruce, Ph.D. .............. Northwestern
Rehder, John B., Ph.D. .............. Louisiana State
Schmudde, Theodore H. (Emeritus), Ph.D. .... Wisconsin

Associate Professors:

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

Assistant Professor:

Grisino-Mayer, Henri, Ph.D. .............. Arizona

The department offers the Master of Science and Doctor of Philosophy degrees. The master's degree emphasizes development of professional competence as a geographer and offers opportunities to gain substantial depth in a concentration or a major technique. An emphasis in geographic information science is available for students who have appropriate backgrounds in mathematics and computer science. The doctoral program is for those who have demonstrated proficiency in conducting independent research. The department is particularly well-qualified to direct graduate work in location analysis, transportation geography, urban and rural geography, cultural ecology, and the geography of the natural environment (especially biogeography and geomorphology). The faculty is qualified to direct students from a variety of approaches ranging from historical and humanistic to rigorously analytic and GIS-based.

THE MASTER'S PROGRAM

The department offers the thesis and non-thesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergraduate major program. The M.S. program requires students to have background in quantitative methods equivalent to the course content of Geography 415, and some familiarity with key themes and approaches in both physical and human geography. At least two-thirds of the total hours in the degree program must be at or above the 500 level and must include 501 (at each offering during residency), 504, and 3 semester hours at the 600 level. In the thesis option, 6 hours must be Thesis 500. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The 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; these should have been achieved in a comprehensive master's program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program must include 504, 515, 589, 9 hours of 600-level seminars, and (at each offering during residency) 501. A minimum of 9 semester hours must be earned in collateral fields, with courses selected for their relevance to the special fields. Ph.D. students whose Master’s level work was in a field other than geography and for whom the Master’s area remains close to their Ph.D. specialty areas may petition to substitute geography units in courses outside of their specialty areas for up to 3 of the 9 required outside units. Competency in quantitative methods and basic human and physical geography is required. Additional tools, including languages, will be required as appropriate to the student's areas of research specialization.

Examinations required for admission to candidacy include a written comprehensive examination, composition of two written examinations in which the student will be tested on his/her knowledge of two special fields, and related areas of geography; an oral examination on the student's program, the special fields and related areas, and the dissertation proposal. All parts of the written comprehensive examination should be taken within the same semester.

MINOR IN ENVIRONMENTAL POLICY

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

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The Ph.D. program in Geography is available to residents of the states of Alabama, Arkansas, Mississippi, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

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

411 Computer Mapping and Geographic Information Systems (3) Principles of surveying, management, and presentation of digital data for spatial analysis; cartographic data structures. Prereq: 310 Introduction to Cartography and consent of instructor. (Same as Information Management 431.) 2 hrs and 1 2-4 hr lab.

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

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

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

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

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

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

434 Climatology (3) General circulation system leading to world pattern of climates. Climate 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. Effects of continental drift, Pleistocene climatic change, and human activity on world biota. Prereq: Geography of the Natural Environment or consent of instructor.

436 Water Resources (3) Global water resources and hydrologic processes: water availability, flooding, and water quality issues from physical and economic geographic perspectives. Prereq: Geography of the Natural Environment or consent of instructor.

439 Plant Geography of North America (3) Characteristics and distribution of major plant communities of Canada, the U.S., Mexico, and Central America. Relationships among biomes, vegetation of the United States, and conservation needs. Prereq: Geography of the Natural Environment or consent of instructor.

441 Urban Geography of the United States (3) Concepts and theories concerning development and significance of systems of cities and internal morphol-
Geological Sciences

(Continued from page of Arts and Sciences)

MAJOR DEGREES

Geology ........................................... M.S., Ph.D.

William M. Dunne, Ph.D.

Professors:

Broadhead, Thomas W., Ph.D. .......... Iowa
Byerly, Don W. (Emeritus), Ph.D. .... Tennessee
Driese, Steven G. (Liaison), Ph.D. ..... Wisconsin
Dunne, William M., Ph.D. .......... Bristol
Hatcher, Robert D., Jr. (Distinguished Scientist), Ph.D. ..... Tel-Aviv
Kopp, Otto C. (Emeritus), Ph.D. ......... Columbia
Labotka, Theodore C., Ph.D. ............. Caltech
McKinney, Michael L., Ph.D. .......... Yale
McSween, Harry Y. (Distinguished Prof.), Ph.D. ..... Harvard
Misra, Kula C., Ph.D. ................. Western Ontario
Mora, Claudia I. (Carden Prof.), Ph.D. .... Virginia Tech
Taylor, Lawrence A., Ph.D. ............ Lehigh
Walker, Kenneth R. (Emeritus), Ph.D. ..... Yale

Associate Professors:

Clark, G. Michael, Ph.D. .......... Penn State
Mckay, Larry D. (Jones Prof.), Ph.D. ..... Waterloo
Williams, Richard T. II., Ph.D. ...... Virginia Tech
Uhle, Maria (Jones Prof.), Ph.D. ........ Virginia

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.

In addition, an applicant must provide transcripts of previous university work, two letters of recommendation, and GRE scores (general). Students are not normally admitted under non-degree status. Prerequisite for both degrees is a Bachelor’s degree, including coursework in mineralogy, optical mineralogy, petrology, stratigraphy, paleontology, structural geology, and field geology. One year of coursework in calculus and chemistry and one year of coursework in biology, physics, or statistics are also required. Applicants lacking any of these may be admitted, but the deficiencies must be removed within the first year without graduate credit. Substitutions may also be allowed.

THE MASTER’S PROGRAM

The department offers the thesis option in the master’s program. Graduation requires successful oral defense of a written thesis and a minimum 3.0 GPA in all graduate coursework.

Course requirements are a minimum of 30 semester hours, including:

1. Six hours of Thesis 500.
2. Registration in 595 for the first two years in residence. Two hours may be counted toward the 30-hour minimum. This requirement may be waived in unusual circumstances.

3. Sixteen hours of geology courses, with at least 14 hours at the 500 or 600 level, including at least one course from any of the following five groups:

- Group 1: 410, 460, 475, 480, 530, 563, 565, 566.
- Group 5: Any 400- or 500-level courses with graduate credit from related departments (allied sciences, mathematics, and engineering), selected with approval of the advisor.

4. Eight hours of additional graduate coursework.

THE DOCTORAL PROGRAM

The prerequisite for the Ph.D. program, in addition to that for the M.S. program, is either a Master’s degree in Geology, or a Bachelor’s degree plus completion of 24 hours of graded coursework with at least one course from any of the three groups listed in #3 above. These courses may be taken while completing other course requirements.

Graduation requires passing a comprehensive examination, taken no later than at 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 of related fields. The candidate is expected to be conversant in a wide field of geological sciences. A minimum of 24 hours of graded coursework beyond the master’s degree is required in addition to the 24 hours of Dissertation 600. The coursework includes the sum of 9 hours of 600-level geology courses, 9 hours of 500-level or higher geology courses, and 6 hours of additional graduate courses. Extra-departmental coursework is encouraged.

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

GRADUATE COURSES

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


411 Optical Mineralogy (2) Laboratory course on principles of optical mineralogy and use of petrographic microscope to identify rock-forming minerals with applications to petrology and environmental mineralogy. Prereq: Mineralogy.

412 Elements of X-ray Diffraction (2) Laboratory course on principles of x-ray diffraction. Phase identification, quantitative determination of mineral abundances in mixtures, and crystal structure determination. Prereq: Mineralogy.

420 Paleogeology (4) Principles of ecological analysis as applied to fossils and fossil assemblages: data collection and interpretation. Laboratory designed around preparation of scientific reports based on field and laboratory analysis. Writing emphasis course. 3 hrs and 1 lab.

421 Invertebrate Paleontology (4) Survey of invertebrate animal phyla: skeletal structure and preservation, functional morphology, ecology, and stratigraphic distribution. Prereq: Paleobiology or consent of instructor. 2 hrs and 2-1/2 hrs lab.

440 Field Geology (5) Summer field course for advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus and required full time of student. Synthesis of major aspects of geological sciences in societal context. Field techniques demonstrated, practiced, and applied to solution of geological problems. Completion of major core courses and consent of instructor.

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

455 Basic Environmental Geology (3) Applications of geological sciences toward comprehension of effects of geological processes on humans and effects of human activities on earth’s environments. Prereq: The Dynamic Earth. 2 hrs and 1-1/2 hr-lab or field period.

460 Principles of Geochemistry (4) Applications of chemical principles to geologic systems: problem-solving techniques. Phase diagrams, partitioning of trace elements, thermodynamic principles for evaluating stabilities of mineral assemblages, aqueous solutions, and applications of radiogenic and stable isotopes to geologic systems. Prereq: Chemistry 120-121. Mathematics 141-142 Calculus I, II. Recommended prerequisite: Geochemistry 330 or equivalent. 3 hrs and 1-1/2 hour tutorial.

470 Applied Geophysics (3) Basic principles of geophysics and applications to environmental engineering problems. Seismic and electromagnetic methods. Prereq: 6 hours of geology courses numbered above 300, Elements of Physics.

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

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

480 Principles of Economic Geology (4) Ore-forming processes, classification of mineral deposits, survey of economic geology with case studies, and examples, and metallogenesis. Prereq: 310 and 330 or equivalents. Recommended prerequisite: 460. 1 hr and 1-1/2 lab.

485 Principles of Hydrogeology (3) Physical principles of flow, fluid potentials, and groundwater. Aquifer analysis, water well design/testing, introduction to transport processes. Prereq: The Dynamic Earth; Calculus; Fundamentals of Physics or equiva-
lent, or consent of instructor. (Same as Civil Engineering 485).

486 Hydrogeology Laboratory (1) Application and demonstration of hydrogeological principles in field and laboratory. Prereq or coreq: 485 or Environmental Engineering 535 or consent of instructor.

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

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

505 Structure of the Southern and Central Appalachian (2) Structural development of Southern and Central Appalachians from extensional Late Proterozoic–early Paleozoic to geologic materials. Prereq: General Chemistry or equivalent, or consent of instructor. (Same as Geological Sciences 430.)

510 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of mineralogical techniques in clay mineral studies. Prereq: 310 and 566 or equivalent. 2 hrs and 1 lab.

521 Data Analysis in Geology and Environmental Sciences (3) Application of statistical and other quantitative techniques using computers to analyze geologic and environmental data; environmental problems.

530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subvolcanic processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. Prereq: 410. 3 hrs and 1 lab.

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

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

544 Paleopedology (3) Field, microscopic, and chemical study of sediments of ancient soils (paleosols) and comparison with modern analog soils; interpretation of changes in paleoweathering processes, paleoclimate, and paleoatmospheric chemistry over 4.6 billion years of earth history based on paleosols. Prereq: 340 Stratigraphy and Sedimentation or equivalent, general chemistry, or consent of instructor.

546 Sandstone Petrology/Physical Sedimentology (4) Field and microscopic analysis of terrigenous clastic rock types; physical processes of sedimentation, transport of sediment, and formation of sedimentary structures. Prereq: 340 or equivalent. 3 hrs and 1 lab.

556 Ice-Age Environments and Global Climate Change (3) (Same as Ecology and Evolutionary Biology 556.)

557 Quaternary Ecology (3) (Same as Ecology and Evolutionary Biology 557.)

563 Stable Isotope Geochemistry (3) Theoretical aspects of isotope fractionation and applications to geologic systems. Isotope exchange, variations in natural waters, diageneric, hydrothermal and metamorphic systems. Prereq: General Chemistry or equivalent.


568 Geochemical Analysis (3) Collection and treatment of geochemical data using electron microprobe, x-ray fluorescence, and atomic absorption spectrophotometry techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.

570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. Prereq: 370 or equivalent, or consent of instructor. 3 hrs and 1 lab or seminar.

572 Fracture Analysis (3) Field and subsurface characterization, and mechanical development of natural fractures: role in groundwater flow. Prereq: Structural Geology or equivalent, or consent of instructor. (Same as Civil Engineering 572.)

575 Tectonics (4) Evolution of Earth's lithosphere in context of plate tectonics theory; Formation of continents through comparative anatomy of mountain belts, including Appalachians, Alps, Urals, Caledonians, Cordillera, Andes, and Himalayas. Prereq: Structural Geology or consent of instructor. 3 hrs and 1 seminar.

576 Reflection Seismology (3) Imaging subsurface features using reflected seismic waves. Energy sources, modes of wave propagation, field procedures, computer data processing, and pitfalls. Applications to tectonic and environmental problems. Prereq: 470 or consent of instructor.

585 Contaminant Hydrogeology (3) Physical transport processes, isotopes and groundwater age dating, processes influencing inorganic and microbial contaminants, and characterization of contaminated groundwater, aquifer protection, and contaminated site remediation. Prereq: 485 or 535; 460; or Environmental Engineering 553 or equivalent; and consent of instructor.

586 Field and Laboratory Methods in Hydrogeology (3) Research methods. Measurement of hydraulic properties, drilling, sampling and instrumentation, tracer experiments. Formulating hypotheses and research plans. Prereq or coreq: 485 or Environmental Engineering 535; and consent of instructor.

590 Special Problems in Geology (1-15) Directed study of special topics. Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

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

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

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

595 Selected Topics in Geology (1) Presentation of research by faculty and visiting scientists. Registration required each semester for resident full-time graduate students, except in summer and when registered for 596. S/NC only.

596 Geology Colloquium (1) Preparation and oral presentation of scientific material. Grade based on content, preparation, presentation, and instructor critique in departmental seminar. Taken only once during residence for each graduate student.

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

620 Seminar in Paleontology (3) May be repeated with consent of department. Maximum 9 hrs.

630 Seminar in Petrology (3) May be repeated with consent of department. Maximum 9 hrs.

640 Seminar in Sedimentary Geology (3) May be repeated with consent of department. Maximum 9 hrs.

650 Seminar in Geomorphology and Quaternary Geology (3) May be repeated with consent of department. Maximum 9 hrs.

660 Seminar in Geochemistry (3) May be repeated with consent of department. Maximum 9 hrs.

670 Seminar in Structural Geology (3) May be repeated with consent of department. Maximum 9 hrs.

675 Seminar in Geophysics (3) Advanced treatment of selected topics in geophysics. Prereq: 470 or consent of instructor.

685 Seminar in Hyrogeology (3) May be repeated with consent of department. Maximum 9 hrs.

German

See Modern Foreign Languages and Literatures

Health and Safety Sciences

(College of Human Ecology)

MAJORS DEGREES

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

Delores Smith, Interim Head

Professors:

Gorski, June, Dr.P.H. ................... UCLA
Hamilton, Charles B. (Liaison), Dr.P.H. ................... Oklahoma
Kirk, Robert H., H.S.D. ............... Indiana
Wallace, Bill C. (Liaison), Ed.D. ................... Northern Colorado

Associate Professors:

Pursley, R. Jack, Ph.D. ............... Iowa

Assistant Professor:

Klein, Diane S., Ph.D. ................ Arizona State
Smith, Susan M. (Liaison), M.S. .... Tennessee

The Health and Safety Sciences Department offers graduate programs leading to the Master of Science with majors in Health Promotion and Health Education and in Safety; and to the Master of Public Health degree in Public Health. The department provides doctoral preparation through a concentration in Human Ecology. Inquiries should be directed to the department head. Application packets are available by request to department.

The department fosters development of pre-professional and professional competencies by those interested in the disciplines of health education/promotion, public health, and safety. The Health and Safety Sciences academic programs emphasize health promotion (lifestyle behaviors) and health protection (regulatory, environmental and safety) strategies for improving individual and community well-being, directly relating to two UT thematic areas of strength, health and biomedical sciences and children and families. The faculty are committed to the educational value of community-based service learning, applied research, and community outreach. For more information, http://hss.he.utk.edu.

Health

A graduate program is available leading to the Master of Science with a major in Health Promotion and Health Education (thesis and
Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentrations are available: community health education, gerontology, and health planning/administration. Preparation for professional practice in improving community health emphasizes a population perspective, service-learning and application opportunities through rigorous internships. The M.P.H. program is accredited by the Council on Education for Public Health. A minor in statistics is available to interested M.P.H. students due to public health affiliation with the Intercollegiate Graduate Statistics Programs.

ADMISSION REQUIREMENTS

A statement of the applicant's educational and career goals and three rating forms are required. Request application packet from the department. Preference for admission to degree status shall be given to those with a minimum undergraduate grade-point average of 3.0 and with at least one year of professional experience in a health-related occupation. As a restricted program, non-degree admission requires department recommendation. Deadlines for completed applications are 1 February for Summer term and 1 April for Fall semester.

THE MASTERS PROGRAM

The M.P.H. is a non-thesis program requiring completion of 38 semester hours of coursework including 9 weeks of field practice. The field internship provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in an actual work setting. Students must complete all assigned prerequisite courses and 21 semester hours of the curriculum with a minimum overall GPA of 3.0 prior to placement in the field.

As an alternative to field practice, preparation of a master's essay may be used to fulfill the professional skills development component of the curriculum. Approval must be received from the Public Health Academic Program Committee and is contingent upon consent of major advisor, formal written proposal by the student, and completion of an additional research methods course. Written guidelines stipulating expectations and eligibility criteria are available.

Requirements include:

1. Public Health Foundation courses (16 hours): 509, 510, 520, 530, 540, 555.
2. Internship (6 hours): 587, 588.
3. Concentration of Study (16 hours). Required and recommended electives will be selected by the student in consultation with the major advisor. A list of courses is available for each concentration: community health education, gerontology, and health planning/administration.

For more information, refer to the website: http://hss.he.utk.edu/pubhealth.

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

The College of Human Ecology offers a coordinated dual program leading to the conferral of both the Master of Science with a major in Nutrition (public health nutrition concentration) and the Master of Public Health. The dual program allows students to complete both degrees in less time than would be required to earn both degrees independently.

The program is designed to meet the needs of students who are interested in the benefits of majors in both nutrition and public health. Therefore, it accommodates the interests of students who: 1) plan a career in public health nutrition and want to acquire the knowledge and skills of the nutritionist and public health professional; 2) plan a career in nutrition and want to acquire the knowledge and skills and the perspective of the public health professional; or 3) plan a career in public health and want to acquire the knowledge, skills and perspective of the nutritionist.

Admission Requirements

Applicants for the M.S.-M.P.H. program must make separate application to, and be competitively and independently accepted by,
the Department of Nutrition for the M.S., Department of Health and Safety Sciences for the M.P.H., and the Public Health Academic Program Committee.

Students who have been accepted by both departments may apply for approval to pursue the dual program anytime prior to, or after, matriculation in one or both departments. Such approval will be granted, provided that dual program studies be started prior to entry into the fourth semester of the M.S. and M.P.H. programs.

Curriculum
A dual degree candidate must satisfy the requirements for both the M.S. (public health nutrition concentration) and the M.P.H. degrees, as well as the requirements for the dual program. All candidates for the dual degree must successfully complete Health and Society (PH 555), two credits of Seminar in Public Health (PH 509), and a minimum of 60 credits. The Department of Nutrition will award a maximum of 9 semester hours of credit toward the M.S. degree for successful completion of approved graduate level courses offered in the Department of Health and Safety Sciences. The Department of Health and Safety Sciences will award a maximum of 11 semester hours of credit toward the M.P.H. degree for successful completion of approved courses offered in the Department of Nutrition. All courses for which such cross-credit is awarded must be approved by the Public Health Academic Program Committee and the student’s graduate committee. A single block field experience (or public health internship) is required of all students and the analytical field paper incorporates public health nutrition and the student’s public health concentration.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward the M.S. or M.P.H. degree for courses taken in the other program, except as such courses qualify for credit without regard to the dual program.

Approved Dual Credit
M.S. courses to be counted toward the M.P.H. program must include 10 semester hours of Field Study in Community Nutrition (NTR 515) and 1 semester hour of Graduate Seminar in Public Health (NTR 509). M.P.H. courses to be counted toward the M.S. must include Public Health Administration (PH 520), Biostatistics (PH 530), and Epidemiology (PH 540).

MINOR IN GERONTOLOGY
Graduate students in Public Health may pursue a specialized minor in gerontology. This interunit/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. 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 on an in-state tuition basis. The M.P.H. program in Public Health is available to residents of the state of Arkansas. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

**GRADUATE COURSES**

<table>
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<tbody>
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<td>Consumer Health (3) (Same as Health 400.)</td>
<td>4</td>
</tr>
<tr>
<td>410-411-412-413-414-415</td>
<td>Worksite Health Promotion (3) Foundations of health promotion programs delivered in worksite that revolve around issues relative to employees and management: theory, program design, implementation and evaluation from perspective of health promotion specialist. Prereq: Health Education, Promotion, and Behavior.</td>
<td>4</td>
</tr>
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<td>493</td>
<td>Directed Independent Study (1-3) Individual in-depth study of selected issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.</td>
<td>3</td>
</tr>
<tr>
<td>502-503</td>
<td>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.</td>
<td>3</td>
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<tr>
<td>509</td>
<td>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 internal and external. May be repeated. Maximum 4 hrs.</td>
<td>1</td>
</tr>
<tr>
<td>510-511-512-513-514-515</td>
<td>Environmental and Occupational Health (2) Complexities of personal and ambient environment recognizing health as individual’s response to diverse and dynamic world. Principles of occupational safety and health. Survey of contemporary issues and their implications for health today and in future.</td>
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<td>520</td>
<td>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 managerial concepts/techniques/process.</td>
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<td>521</td>
<td>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.</td>
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<tr>
<td>523</td>
<td>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 types of programs. Prereq: 521 or consent of instructor.</td>
<td>3</td>
</tr>
<tr>
<td>525</td>
<td>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 techniques. Prereq: 520 or consent of instructor.</td>
<td>3</td>
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<tr>
<td>530</td>
<td>Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology. Prereq: Introductory statistics or consent of instructor.</td>
<td>3</td>
</tr>
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</table>

**Course Registration**

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

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<td>525</td>
<td>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 techniques. Prereq: 520 or consent of instructor.</td>
<td>3</td>
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<td>530</td>
<td>Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology. Prereq: Introductory statistics or consent of instructor.</td>
<td>3</td>
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**540 Principles of Epidemiology (3)** Distribution and determinants of health-related outcomes in specified populations, with application to control of health problems. Historical origins of discipline, hypothesis formulation, research design, data and error sources, measures of frequency and association, etiologic reasoning, disease screening, and injury control. Prereq: consent of instructor. | 3 |

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

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

**552 Community Health Problem Solving (4)** Dynamics of community organization, community needs assessment, educational interventions, and application of program planning and evaluation techniques. Opportunity to practice skills in realistic setting. Prereq: 550 or consent of instructor. | 3 |

**555 Health and Society (3)** Understanding of social and behavioral factors which influence health status and care in America. Application to behavior in health-related organization. Social and psychological aspects of disease, sociological aspects of health care delivery systems, political economy of health and illness, impact of social movements on health, and social consequences of health legislation. | 3 |

**561 Theories and Techniques in Health Planning (4)** Overview of health planning concepts and methodologies; systems-oriented planning process. Major elements of planning: formulation and conceptualization of problem, plan design, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnoses, and programs for addressing needs. | 3 |

**568 Physical Activity and Positive Health (3)** | 3 |

**569 Clinical Exercise Physiology (3)** | 3 |

**580 Special Topics (3)** Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs. | 1 |

**585 Seminar in Gerontology (1)** | 1 |

**587-88-89 Internship (3,3,3)** Internship (community health education, gerontology, or health planning/ administration) in either a public/private entity or research setting under supervision of designated preceptor. Prereq: M.P.H. major, one semester advance notice and consent of major advisor. 589: available only for approved extended placements. S/NC only. | 3 |

**590 Research Methods in Health (3)** | 3 |

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

**650 Health Aspects of Gerontology (3)** | 3 |

**655 Seminar in Nation’s Health (3)** | 3 |

**660 International Health (3)** | 3 |

**Safety**

Graduate study with a major in Safety (thesis and non-thesis options) leads to the
Master of Science degree. Graduate students may concentrate in safety management or in emergency management. The M.S. degree program requires completion of 33 semester hours. Degree requirements include completion of the 18-hour core curriculum and completion of a concentration area (15 hrs.). Concentration course options include specific courses offered by the Departments of Health, Human Performance, and Safety Sciences. A list of courses is available for each concentration. Students may elect an internship experience with private industry or non-profit organizations to fulfill part of their course requirements. Curricular experiences will assist graduates in preparation for certified safety professional (CSP) examination.

The graduate program contributes to the University of Tennessee’s mission of health protection by preparing safety professionals with the knowledge and skills necessary to create and maintain safer human environments in the workplace, community, home, and school. The offering of all core classes and required concentration courses on an evening class schedule enables those working full-time in a safety-related field to pursue the M.S. degree with a major in safety on a part-time basis.

For more information, refer to the website: http://hsshe.utk.edu/safety.

GRADUATE COURSES

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

452 Safety Principles and Practices (3) General principles, practices, and procedures in occupational and community safety. Historic and present safety issues, identification, and practices addressing safety of individuals and groups in work-site, school, community, transportation, and industrial settings. Prerequisite: Junior or Senior standing or consent of instructor. Su

460 Fire Risk Management (3) Development, implementation, and management of comprehensive fire safety program. Basic fire risk management concepts, interpretation of codes and exposure to basic fire analysis techniques. Prerequisite: Senior standing or consent of instructor. Su

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

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

532 Behavioral Problems in Safety Education & Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psychology in development of safe behavior in all segments of environment. 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 on behavioral sciences as related to variation incidence of accidents. Sp

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. F

536 Safety Instrumentation (3) Selection, calibration, maintenance, and use of sampling instruments available to safety practitioner for evaluating exposures of workers to physical stresses and airborne contaminants. F

537 Advanced Emergency Management (3) Advanced study in emergency and hazard mitigation planning, response and recovery. Theory and practice in identification of appropriate emergency warning systems, hazard assessment, facility inspection, plan development and implementation. Prerequisite: 535, Sp

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

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

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

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

History

(College of Arts and Sciences)

MAJOR DEGREES

History ............................................. M.A., Ph.D.

Todd A. Diacou, Head

Professors:

Bergeron, Paul H. (Emeritus), Ph.D. Vanderbilt

Brommelt, Palmira R., Ph.D. ............ Chicago

Chmielowski, Edward V. (Emeritus), Ph.D. ........................................ Harvard

Cutler, E. Wayne, Ph.D. ..................... Texas

Farris, W. Wayne, Ph.D. ..................... Harvard

Finger, John R. (Emeritus), Ph.D. ........ Washington

Haas, Arthur G., Ph.D. ..................... Chicago

Hao, Yen-Ping (Emeritus), Ph.D. ......... Harvard

Haskins, Ralph W. (Emeritus), Ph.D. ..... Columbia

Klein, Milton M. (Emeritus) (Distinguished Prof.), Ph.D. .......... Columbia

Moser, Harold, Ph.D. ....................... Wisconsin

Norrell, R. Jeff (Barnadotte Schmitt Prof.), Ph.D. .......... Virginia

Ratner, Lorman A. (Emeritus), Ph.D. ... Cornell

Utley, Jonathan G. (Emeritus) .......... Illinois

Wheelier, W. Bruce, Ph.D. ............... Virginia

Associate Professors:

Appier, Janis, Ph.D. ......................... California (Riverside)

Ash, Stephen V., Ph.D. ................. Tennessee

Bast, Robert J., Ph.D. .................... Arizona

Bohstedt, John, Ph.D. ..................... Harvard

Brady, Sharon P., Ph.D. .................. Cornell

Burman, Thomas E., Ph.D. .......... Toronto

Diacou, Todd A., Ph.D. .................. Wisconsin

Fleming, Cynthia G., Ph.D. .............. Duke

Glover, Lorri, Ph.D. ....................... Kentucky

Higgs, Catherine A., Ph.D. ............ Yale

Lulieviucis, Vegas G., Ph.D. .......... Pennsylvania

Piehler, G. Kurt, Ph.D. ................. Rutgers

Pinkney, Paul J., Ph.D. ................. Temple

Assistant Professors:

Brosnan, Kathleen, Ph.D. .............. Chicago

Dessel, J. P., Ph.D. ....................... Arizona

DeWeerdt, Hilde, Ph.D. ................. Harvard

Kulikowski, Michael, Ph.D. .......... Toronto

Liu, Lu, Ph.D. ......................... California (San Diego)

Sahadeo, Jeff, Ph.D. .................... Illinois

White, George, Jr., Ph.D. ............. Temple

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 and group III teaching 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).

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 under group II doctoral fields may be applied toward the M.A. degree. Except by prior approval of the Director of Graduate Studies, a student’s coursework must be at the 500 level or above.

Thesis Option

Twenty-four hours of coursework and 6 hours of Thesis 500 for a total of 30 hours are required. Thesis students are required to select one M.A. field and write a thesis. At the end of the program the thesis student will stand for a two-hour oral examination on both the thesis and the field.

Non-Thesis Option

A total of 30 hours of coursework is required. At least 6 hours must be completed in each of two M.A. fields. The primary field is examined by a two-hour written followed within one week by a one-hour oral examination with the single grade of pass/fail given at the conclusion of the oral examination. No examination is given on the second field.

M.A. Fields

United States (colonial to present)

Prewmodem Europe

Modern Europe

Asia
Retention and Termination
A 3.0 overall grade-point average is required to remain in good standing. M.A. students must take the M.A. examination no later than the semester following the completion of 30 hours. A student who fails the M.A. examination must repeat the examination no later than the following semester. A student who fails the examination a second time or does not take the examination when required will be dropped from the graduate program.

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

Residence and Coursework
Before being admitted to doctoral candidacy, a student must:
1. Complete History 510 at UT (may be waived for comparable experience elsewhere).
2. Spend two consecutive semesters in residence.
3. Complete 9 hours in one Group I doctoral field. There is no minimum hours requirement for a Group II field. Complete 9 hours in one Group III field, including the appropriate 511, 512, or 513 course and two additional courses at the 500 level. The Group III field must be in a different geographic area from the Group II field. Courses taken to fulfill M.A. degrees may be counted toward all field requirements.
4. Fulfill the foreign language requirement.
5. Complete two 600-level research seminars. (One must be completed at UT.) Students who have completed a master’s thesis need complete only one research seminar (must be taken at UT), and History 621.
6. Maintain a 3.0 overall grade-point average in graduate work attempted.
7. Complete 24 hours of graduate coursework (21 hours graded A-F) at UT beyond that required for the M.A. Up to 6 hours may be taken outside of the department.
8. Except by prior approval of the Director of Graduate Studies, a student’s coursework must be at the 500 level or above.

Language Requirements
Students must demonstrate competence in one foreign language through coursework or examination. The student’s doctoral committee may specify any other languages or research tools, such as statistics, essential for the student’s preparation. The foreign language requirement must be fulfilled before taking the comprehensive examination.

Group III (Teaching Field) Examination
This is a one-hour oral exam which must be completed at any time before the comprehensive examination is taken. If a student fails this, he or she may retake the exam one time only and must do so the following semester.

Comprehensive Examination
The comprehensive examination is to be taken no later than the semester following the term in which the student has completed the residence, coursework, and language requirements. A student stands examination in one field selected from Group I and one field selected from Group II below. Both parts are 8 hours, written, and taken during the same semester. A general oral exam will be taken following the successful completion of the two written portions. The two written and one oral exams are separate examinations, and Group I must be passed before taking Group II, and the latter passed prior to taking the oral portion. A student who fails any one of the three parts (Group I or Group II or the Oral) which constitute the Comprehensive Exam must repeat the failed exam the following semester, excluding summer. A second failure on any one of the three parts (regardless of which one) will cause the student to be dropped from the History graduate program. Likewise, a student who does not repeat a failed exam within the allotted time (one semester) will be dropped from the program.

Admission to Candidacy
Upon successful completion of the above requirements, a doctoral student may be admitted to candidacy.

Doctoral Fields
Group I:
- Premodern Europe
- Modern Europe
- United States (colonial to present)

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

Group III (Examined Teaching Field):
- World History
- Western Civilization
- U.S. Civilization

Dissertation and Defense
Original research forms the basis for the dissertation. Doctoral candidates must register for a minimum of 3 hours of 600 Dissertation Research each semester and must complete 24 hours of dissertation credit. A final oral defense is given on the dissertation in its historical context. The program must be completed within eight years from admission as a potential candidate.

GRADUATE COURSES

500 Thesis (1-15) P/NP only. 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 Foundations of Graduate Study in History (3) Assumptions and methods of historians. Required of all candidates for advanced degrees. F
511 Teaching World History (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in world history.
512 Teaching Western Civilization (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in western civilization.
513 Teaching United States History (3) Methodology, conceptualization, historiography, text-book selection and syllabus construction to prepare students to teach courses in U.S. history.
521 M.A. Readings (3) Directed readings in preparation for M.A. examinations. Open only to master’s candidates in history. May be repeated. Maximum 6 hrs. S/NC only.
531 Topics in Premodern Europe (3) Reading seminar: secondary sources on premodern European movements and trends. Focus varies. May be repeated. Maximum 15 hrs.
532 Topics in Modern Europe (3) Reading seminar: secondary sources on movements and trends that are multinational in focus. Focus varies. May be repeated. Maximum 15 hrs.
533 Topics in European National History (3) Reading seminar: secondary sources on intra-national topics, usually British, Russian, German or French. Focus varies. May be repeated. Maximum 15 hrs.
541 Topics in Early American History (3) Reading seminar: secondary sources on early North American history. Focus varies. May be repeated. Maximum 15 hrs.
542 Topics in 19th-Century United States (3) Reading seminar: secondary sources on 19th-century United States. Focus varies. May be repeated. Maximum 15 hrs.
543 Topics in 20th-Century United States (3) Reading seminar: secondary sources on 20th-century U.S. Focus varies. May be repeated. Maximum 15 hrs.
544 Topics in U.S. Environmental History (3) Reading seminar: secondary sources on U.S. environmental history. Focus varies. May be repeated. Maximum 15 hrs.
551 Topics in the History of Foreign Relations (3) Reading seminar: secondary sources on foreign relations. Focus varies. May be repeated. Maximum 15 hrs.
552 Topics in Military History (3) Reading seminar: secondary sources on military history; military operations, social impact of war and naval strategy in foreign policy. May be repeated. Maximum 15 hrs.
555 Topics in United States Social and Economic History (3) Reading seminar: secondary sources on U.S. social and economic history. Focus varies. May be repeated. Maximum 15 hrs.
556 Topics in European Social and Economic History (3) Reading seminar: secondary sources on social or economic history of European nations. Focus varies. May be repeated. Maximum 15 hrs.
557 Topics in Cultural and Intellectual History (3) Reading seminar: secondary sources on cultural and intellectual history. Focus varies. May be repeated. Maximum 15 hrs.
558 Topics in United States Regional and Local History (3) Reading seminar: secondary sources on regions, states and cities of the South. Focus varies. May be repeated. Maximum 15 hrs.
THE DOCTORAL PROGRAM

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

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

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

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

Declaration of a Minor

Prior to earning more than one-half the total hours required for this minor, students must complete a “Declaration of a Minor in the College of Human Ecology” form. Copies of this form are available in the Dean’s Office, Room 110, Jessie Harris Building.

Core Experience

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

1. Coursework. 9 hours required. A variety of coursework may be taken toward satisfaction of this requirement. Courses which are offered on a regular basis include: Health 406, 465, Health/Public Health 650, Nutrition 518, Public Health 523, Social Work 566, Sociology 415, Psychoeducational Studies 504, 522, 525, 528.

2. Applied practicum. 2 hours required. Students should register under practicum experiences in the “home” department of the supervising faculty.


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.

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 on an in-state tuition basis. The Ph.D. program in Human Ecology is available to residents of Alabama, Kentucky, Mississippi, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

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

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

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or has been approved by the student’s faculty advisor. May not be used toward degree requirements. May be repeated. S/NC only. E

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

520 Directed Study in Human Ecology (1-3) Integrative topics. Prereq: At least 9 hours 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 Human Ecology (1-6) Field based experiences. Prereq: Consent of instructor. E


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

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

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

Human Ecology

(College of Human Ecology)

MAJOR DEGREE

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

The College of Human Ecology offers the Doctor of Philosophy degree with a major in Human Ecology.

ADMISSION REQUIREMENTS

A completed file for review includes the Graduate Application for Admission file, departmental application, Graduate Record Examination (GRE) scores for the general section, and three Graduate 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.
Human Resource Development

(Major of Human Ecology)

MAJORS DEGREES
Human Ecology ........................................ Ph.D.
Human Resource Development .................. M.S.

Michael Lane Morris, Interim Head

Professors:
Brewer, Ernest W. (Liaison), Ed.D. ................. Tennessee
Campbell, Clifton P. (Emeritus), Ed.D. Maryland
Cheek, Gerald D. (Emeritus), Ph.D. ......................... Kansas State
Coakley, Carroll B. (Emeritus), Ph.D. ................. Wisconsin
Craig, David G. (Emeritus), Ed.D. ............... Cornell
DeJonge, Jacqueline O. (Emeritus), Ph.D. .................... Arizona State
Haskell, Roger W. (Emeritus), Ph.D. .... Purdue
Mathews, John I. (Emeritus), Ph.D. ........... Iowa State
Petty, Gregory C., Ph.D. ..................... Missouri

Associate Professors:
Kupritz, Virginia, Ph.D. ................. Virginia Tech
Stout, Vickie J., Ed.D. ....................... Tennessee

Assistant Professors:
Bartley, Sharon, Ph.D. ................. Tennessee
Hastings, Shirley, Ph.D. ................. Oklahoma State
Lim, Doo, Ph.D. ................. Pennsylvania State
Pierce, Randal, Ph.D. .................... Ohio State
Sorter, Ann, M.S. ....................... Clemson

The Department of Human Resource Development advances economic development through the integration of occupational education, training, career development, and organizational development. HRD required (core) courses and HRD electives are offered in evening/online/weekend/or workshop formats enabling working professionals to obtain the master’s or doctoral degree.

THE MASTER’S PROGRAM

The Master of Science degree with a major in Human Resource Development provides a flexible graduate program for professionals wishing to pursue in-depth study within and across subject areas of Human Resource Development; those who work with individuals to help them enter the workforce; those who train individuals already in the workforce; and those who help individuals in the workforce advance their potential.

The M.S. degree with a major in Human Resource Development offers two concentrations, each providing opportunities for specialized interests. Both concentrations require a thesis. The training and development concentration is designed to meet the needs of professionals who work in programs encompassing all areas of human resource development. Applicants without an undergraduate degree in an area related to human resource development may be required to take 501 as a prerequisite and to complete an internship as part of their program. The teacher licensure concentration is specifically for students who seek initial teacher licensure in family and consumer sciences education, business, and marketing education, and technology education. This program requires admission to Teacher Education and has specific prerequisites.

Admission Requirements
Training and Development Concentration applicants are to submit the Graduate Application for Admission, three letters of reference from individuals familiar with their potential for success in academic work, and a statement describing personal career objectives directly to the Department of Human Resource Development. Applicants must hold a bachelor's degree from an accredited institution and present evidence of ability to do graduate work, including a GPA of at least 2.7 on a 4.0 scale for the last two years of undergraduate work. Any student below this level of academic quality must justify admission via other exceptional credentials. If the applicant has prior work experience in human resource development, a reference letter should also be provided by the work supervisor. Recent Graduate Record Examination scores are required of all applicants.

Teacher Licensure Concentration applicants are to submit the Graduate Application for Admission and are to be admitted to the Teacher Education Program in order to progress in the Professional Education coursework. Admission to the teacher licensure program requires a minimum 2.75 GPA for Technology Education, Business and Marketing Education, Family and Consumer Sciences Education. In addition, applicants are to have a satisfactory student conduct record; a satisfactory speech and hearing evaluation; passing scores on the Pre-Professional Skills Test or an ACT composite score of 21 or an Enhanced ACT composite score of 22 or a SAT combined score of 990; and a satisfactory Admissions Board interview.

Degree Requirements
Training and Development Concentration is a 36-hour thesis program that includes 3 hours of research methodology and 3 hours of statistics. All students must take the departmental core of eighteen hours consisting of 504, 510, 511, 512, 557 and 559. The thesis requires six hours of Thesis 500 and an oral comprehensive examination.

Teacher Licensure Concentration is a 36-hour thesis program that includes 3 hours of research methodology (504) and 3 hours of statistics. The core (9 hours) of the internship program is 521, 522, 574 and 591 (1 hour). The internship experience (575) is twelve hours of credit and is the culminating experience. Students choose another 3 hours of coursework to support the teaching field. The thesis requires six hours of Thesis 500 and an oral defense.

THE PH.D. CONCENTRATION

Admission Requirements
Applicants are to submit the Graduate Application for Admission, three letters of reference from persons familiar with their potential for success in doctoral work, a statement describing personal career objectives, and a sample of written work directly to the Department of Human Resource Development.

Applicants must hold a master's degree from an accredited institution and present evidence of ability to do Ph.D. work, including having maintained a graduate GPA of 3.3 on a 4.0 scale or better. If the applicant has prior work experience in human resource development, a reference letter should also be provided by the work supervisor. Graduate Record Examination scores are required of all applicants.

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

Degree Requirements
The Doctor of Philosophy degree with a major in Human Ecology and a concentration in human resource development is for graduate students who seek careers in higher education or as managers/administrators of HRD. The curriculum is designed to enable students to achieve professional objectives, develop needed competencies, and gain desirable experiences and understanding of human resource development. Students must possess a master's degree before acceptance to the program. A minimum of 96 hours beyond the baccalaureate is required.

Concentration (12 hours): Must include courses to support Human Resource Development and may be taken from the master's degree.

Departmental Core (27 hours): Must include 510, 511, 512, 557, 559 or equivalents and 12 hours of 604.

Specialization (12 hours): Must support a career path of university faculty member or manager of education/training.

Cognate (6 hours): Must be obtained from an academic unit outside the department, support specialization, and be represented by a committee member.

Research and Statistics (15 hours): Statistics must include advanced statistics such as multivariate analysis and computer application. 9 hours minimum; research methodology must include 504 and 610 or equivalents, 6 hours minimum.

Internship (0-6 hours): Required for those changing career path

Dissertation (24 hours): Must be original research project.

The department offers an alternative approach to residence for the Ph.D. degree. This alternative residence involves, among other requirements, a two-year, continuous enrollment in 604, Research Forum in Human Resource Development.

Detailed information regarding the Ph.D. concentration program of study may be
obtained from the departmental liaison for graduate study.

Note: For latest update, check the homepage of Department of Human Resource Development (http://hrd.he.uky.edu).

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs, at UT on an in-state tuition basis. The M.S. program is available to residents of the state of Kentucky. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

455 Learner and Program Evaluation (3) Assessing effectiveness of training or educational programs; developing performance-based measures; evaluating job performance; and measuring learner progress. Prereq: Consent of supervising instructor. May be repeated. Maximum 9 hrs.

503 Problems in Human Resource Development (1-3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


515 Microcomputer Operations and Programming in Education (3) Operating procedures and BASIC programming for education and training applications. Hands-on experience in operating and programming microcomputers, writing, debugging, and running educational programs using sequential data files, Prereq: Teaching, administrative, or related experience in education or training, or consent of instructor.

516 Microcomputer Software Development (3) Advanced software design in BASIC: random access and binary files, search and sort algorithms, and formatted graphics for environmental education. Hands-on learning and program development. Prereq: 515 or consent of instructor.

521 Design and Development of Instruction (3) Curriculum development and program planning: design of instruction; development of teaching materials for classroom and educational purposes. Intended for students planning careers in industrial education, marketing, technology and/or industrial education.

522 Professional Practices for Educators (3) Topics essential to effective classroom teaching; evaluation of students, youth organizations, advisory committees, classroom management, and emergency situations. Prereq: 515 or consent of instructor. May be repeated. Maximum 9 hrs.

531 Leadership Development for Business Education and Marketing Education Professionals (3) Change management with implications for continuous improvement. Quality improvement, quality assurance, facilitation, and team leadership. Prereq: Consent of instructor.

550 Administration of Industrial Education Programs (3) Developing, staffing, administering and evaluating technical and professional education programs in secondary and post-secondary school settings. Prereq: Consent of instructor.

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.

552 History and Philosophy of Industrial Education (3) Social, political, and economic events that have impacted the development of industrial education. Philosophical problems: justification, values, principles and concepts of industrial education. Prereq: Consent of instructor.

553 Planning Technical Education Facilities (3) Preparatory specifications, site selection, and working relationships with other professionals involved in process of planning technical-education facilities. Prereq: Consent of instructor.

554 Program Planning (3) Instructional systems attending to analysis, design, development, implementation, and evaluation of trade, technical supervision, and related training. Prereq: Curriculum development and program planning. Prereq: Consent of instructor.

555 Curriculum Planning (3) Developing performance-based, criterion-referenced instructional programs.

556 Organizational Development (3) Strategies and interventions for organizational development: training and development, team assessment and design, organizational change and consultant’s role. Prereq: 512 or consent of instructor.

557 Methods of Teaching Conceptual Content (3) Proper selection and effective application of methods for teaching and learning conceptual content. Communication strategies for conceptual content comprehension, retention, and application.

558 Seminar in Industrial Education (1-3) Current issues, innovations, problems associated with technical programs. Prereq: 12 hrs of graduate courses. May be repeated. Maximum 6 hrs.

599 Program Evaluation (3) Concepts, principles, practices, theories, and trends related to program evaluation. Planning and conducting a comprehensive program evaluation in various settings. Fundamentals of design, measurement, return-on-investment (ROI), and presentation and dissemination of results to stakeholders.

600 International Perspective of Workforce Training (3) Examination of technical-education systems in highly industrialized countries. In-school training programs, out-of-school training systems, update training of incumbent workers, retraining displaced workers, transfer of new technologies, and role and responsibilities of businesses, private sector organizations/agencies, and state and federal governmental agencies.

652 Grant Writing and Project Implementation (3) Writing grant proposals, negotiating with funding sources, implementing and maintaining funded programs, and closing out projects at end of funding support.

654 Self-Directed Work Teams (3) Theory and practice of implementing self-directed work teams, motivating employees, increasing employee productivity via teams and related issues.

674 Analysis of Teaching for Professional Development (3) Examine capabilities of workforce systems, and implications on workforce development. Study and application of various approaches. Coreq: 575.

675 Professional Internship in Teaching (1-15) Intensive technical and professional experiences in technical education professional settings in public schools. Enrollment limited to postbaccalaureate students in professional year program. Prereq: Admission to Teacher Education Program. May be repeated. Maximum 12 hrs. S/NC only.

691 Clinical Studies (1-4) Group and individual seminars for volunteers during full-time internship. Application of principles related to training and development. Prereq: Completion and presentation of portfolio and analysis of teaching project. Coreq: 575.

699 Doctoral Research and Dissertation (3-15) Prerequisite: 575.

691 Theory and Practice in Training and Development (3) Theory and application of research related to training and development, transfer of learning, designing effective learning situations, and creation of corporate learning environments. Conceptualization and critical analysis of research and theories related to training and development in field of human resource development. Prereq: Admission to doctoral program.


696 Qualitative Research in Human Resource Development (3) Theory and application of qualitative approaches to social science and human resource development research. Ethnographic methods to obtain in-depth information about behaviors and beliefs of people in natural settings. Use of interviews, focus groups, and participant observation. Prereq: Consent of instructor.


691 Special Topics in Human Resource Development (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
Industrial and Organizational Psychology

(Major of Business Administration)

MAJOR DEGREES

Industrial and Organizational Psychology ........................................... Ph.D.

Robert T. Ladd (Liaison), Director

Committee:
Fowler, Oscar S., Management
James, Lawrence R., Management
Larsen, John M., Jr. (Emeritus), Management
Rentsch, Joan R., Management
Rush, Michael C., Management
Schumann, David W., Marketing, Logistics & Transportation
Woehr, David J., Management

The doctoral program is 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 degree program is administered by a committee appointed by the Dean of Graduate Studies on recommendation from the Management Department head 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 Office of Graduate Student Services (118 Student Services Building) and the Director, Industrial and Organizational Psychology Program, (408 Stokely Management Center, The University of Tennessee, Knoxville, TN 37996-0545).

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

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

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

General Requirements

At least one year of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade-point average of 3.7 or above is required with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) are required. Customarily, those students admitted to the program have performed at or above the 69-79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.)

THE DOCTORAL PROGRAM

The Ph.D. degree with a major in Industrial and Organizational Psychology can be completed with a minimum of 90 semester hours in the major. Students must be in residence full time for one year; must maintain an overall 3.0 grade-point average with no more than one grade below B in the I/O Psychology, General Psychology, and Research core; must complete an applied research project prior to beginning dissertation work; must pass a comprehensive examination; and must pass a final oral examination on their dissertation research.

Course Requirements: Hours

| I/O Psychology Core | 567, 568, & 569 | 9 |
| Research Core | 12 |
| Statistical Principles (Statistics 537 & 538 or equivalents) | |
| Multivariate Statistics (Statistics 579, 679 or equivalent) | |
| Advanced Research Methods (605 or equivalent) | |
| General Psychology Core | 9 |
| One course in each of the following areas: biological bases of behavior, cognitive bases of behavior, history and systems of psychology | |
| I/O Psychology Seminars | 9 |
| 600 level IOPSY courses, from a program committee approved list. | |
| Approved Electives | 9 |
| Courses supporting the student's course of study. | |
| Supervised practicum, internship, or field training (690) | 15 |
| Ethics (635 or equivalent) | 3 |
| Dissertation (600) | 24 |
| TOTAL | 90 |

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The Ph.D. program is available to residents of Kentucky, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

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

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

567-68 Proseminar in Industrial/Organizational Psychology (3,3) Basic thought, concepts, and issues required for advanced graduate study in industrial and organizational psychology. Must be taken during first year of study in program. Consent of instructor required for non-program students.

569 Applied Measurement for Industrial/Organizational Psychology (3) Basic techniques for collection and evaluation of individual and organizational data using both classical and modern psychometric techniques. Pre: Consent not otherwise required. May be repeated. S/NC or letter grade.

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

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

610 Individuals in Organizations Seminar (3) Bridging principles and processes which link individual attributes with macro organization concerns: culture, climate, and group decision-making.

611 Seminar in Organizational Leadership (3) Current theories, concepts, and issues associated with psychology of organizational leadership. Prereq: 567-68 or consent of instructor.

612 Seminar in Work Motivation (3) Current theories, concepts, and issues associated with psychology of work motivation. Prereq: 567-68 or consent of instructor.

613 Seminar in Performance Appraisal (3) Current issues, problems, and research in performance appraisal and criterion development; applications in compensation. Prereq: 567-68 or consent of instructor.

614 Seminar in Employee Selection (3) Current issues, concerns, and methods used in employee selection. Prereq: 567-68 or consent of instructor.

615 Seminar in Organizational Training and Development (3) Current issues, problems, and research in training and development. Prereq: 567-68 or consent of instructor.

625 Topics in Organizational Psychology (3) Topics vary. May be repeated. Maximum 9 hrs.

626 Topics in Industrial Psychology (3) Topics vary. May be repeated. Maximum 9 hrs.

627 Structural Equation Models in Organizational Research (3) Issues related to analysis of organizational data using structural equation and related techniques.

628 Personality Assessment (3) Review of key domains of social cognition: measurement systems which use individual differences in social-cognitive biases as basis for measuring personality.

635 Ethical and Professional Issues in Industrial/Organizational Psychology (3) Issues involved with ethical practice in research, academic, organizational, and consulting situations.

690 Supervised Practicum, Internship or Field Training in Industrial/Organizational Psychology (1-15) One credit hour per 30 hours of practice. S/NC or letter grade.

Industrial Engineering

(Major of Engineering)

MAJOR DEGREES

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

A. B. Badiru, Head

Professors:
Badiru, A. B., PE, Ph.D. ......... Central Florida
Bontadelli, J. A. (Emeritus), PE
Ph.D. ................................. Ohio State
Claycombe, W. W. (Emeritus), PE, Ph.D. ... VPI
Industrial Engineering

select an area of specialization from operations research, human factors engineering, information systems engineering, maintenance and reliability engineering, or general industrial engineering.

Engineering Management

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

Manufacturing Systems Engineering

Under the manufacturing systems engineering concentration, students learn strategies for improving product quality, implementing various production strategies, analysis of production planning and scheduling systems, and supplier and distribution integration. Dual degree students can select manufacturing systems engineering as an option.

Product Development and Manufacturing

The product development and manufacturing concentration is a non-thesis option, available only to students taking the dual M.S.-MBA program.

DUAL M.S.-MBA PROGRAM

The College of Business Administration and the College of Engineering offer an integrated program leading to the conferral of the Master of Business Administration degree with a major in Business Administration (concentration in operations management) and the Master of Science degree with a major in Industrial Engineering (concentration in manufacturing systems engineering or product development and manufacturing).

The Industrial Engineering program is also open to students with undergraduate engineering majors other than industrial engineering.

The establishment of the dual program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes in design and manufacturing and a short product development cycle.

Admission Requirements

Applications are accepted for fall semester only. Applicants for the M.S.-MBA program must make separate application to, and be competitively and independently accepted by, the Office of Graduate Admissions for the Master of Business Administration degree program and the Master of Science degree program with a major in Industrial Engineering, and by the Dual Program Committee.

Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual M.S.-MBA program and the Industrial Engineering major (refer to the MBA program for separate instructions).

Students accepted for both the MBA and the M.S. with a major in Industrial Engineering degree programs will be assigned to Dual Program Committee advisors, who will be responsible for course approval and supervision of the students’ progress through the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by Graduate Admissions for international students.

Curriculum

All engineering students enrolled in the dual program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum consists of 33 hours of common coursework in the College of Business Administration and 15 hours of common coursework in the College of Engineering. Engineering common coursework includes a culminating 3-hour integrated project course requiring a comprehensive report, and a final examination as required by the Dual Program Committee, to be taken during the first session of summer following the second year.

During the second year dual degree candidates will take courses in their engineering major. The coursework for each option is designed to provide students with a concentration in their major and advanced skills to accomplish their teamwork assignments.

Curriculum for Dual M.S.-MBA Degree

August - First Year
BA 511 M.B.A. Core I 3
Fall - First Year
BA 512 M.B.A. Core II 15
IE 504 Product Development Process 1
Spring
BA 513 M.B.A. Core III 9
IE 506 Product Selection and Evaluation 2
IE 508 Integrated Product, Process, and Manufacturing System Design 3
Summer
Internship —
BA 514 Integrated Business Simulation 3
IE 509 Project Management 1
Fall - Second Year
IE 503* Survey of Manufacturing Systems Engineering 1-3
IE 511** Business Planning and Commercialization 3
IE 509 Project Management 1
IE 510 Advanced Topics in Manufacturing Systems 3
IE 524 Advanced Integrated Manufacturing Systems 3
— Elective (IE 514, 519, or 523) 3
Spring
— MBA “hub” course elective 3
IE 509 Project Management 1
IE 522 Optimization Methods in Industrial Engineering 3
IE 512** Process Development and
NOTE: Any 400-level course required in the M.S. degree program.

Bachelor of Science in Industrial Engineering

Certificate in Maintenance and Reliability Engineering

The College of Engineering offers a certificate program in maintenance and reliability engineering. The program is designed primarily for part-time students in the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The MS and the MBA degrees will be awarded upon successful completion of the requirements of the dual program.

Approved Dual Credit

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

Certification in Maintenance and Reliability Engineering

The College of Engineering offers a certificate program in maintenance and reliability engineering. The program is designed primarily for part-time students in the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The MS and the MBA degrees will be awarded upon successful completion of the requirements of the dual program.

Industrial Engineering

Graduate Courses

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


421 Information Systems Analysis and Design (3) Systems engineering approach to analysis, design, development, and implementation of systems, information. Informational requirements of industrial engineering systems. Utilization of relevant software packages. Prereq: Senior standing or consent of instructor. 2 hrs and 1 lab. F

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

423 Industrial Safety (3) Accident causation, losses, and investigative techniques. Role of human, task, machine, and environment in accident prevention. Safety standards, codes, and laws. Product liability, design, evaluation, and management of safety organizations and programs. Hazard recognition, analysis, control and risk assessment, systems safety and related techniques. Prereq: Senior standing or consent of instructor. E

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

483 Introduction to Reliability Engineering (3) (Same as Nuclear Engineering 484, Chemical Engineering 483, and Mechanical Engineering 483.)

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

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

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

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

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

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

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


509 Project Management (1) (Same as Multidisciplinary Team Design) Fundamentals and team design of manufacturing tasks of product to be developed. Project management (budget and schedule), assignment of tasks for team members, and concurrent design and manufacturing. Design concepts and product features reviewed by potential customers/industries. Prereq: Enrollment in project class. May be repeated. Maximum 3 hrs. (Same as Mechanical Engineering 509.)


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

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

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

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

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

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

517 Reliability Engineering (3) Continuous time random processes with applications to availability of equipment and manufacturing systems. Failure densities and failure data analysis. Maintainability, Reliability-based testing for product acceptance. Prereq: 516.

518 Advanced Engineering Economic Analysis (3) Application of engineering economic analysis in com-
plex decision situations. Inflation and price changes; uncertainty evaluation using nonprobabilistic techniques; capital financing and project allocation; evaluations of social, legal, trade union, environmental, and public works projects; probabilistic risk analysis including computer simulation and decision trees; multi-attribute decision analysis; and other advanced topics. Prereq: 405 and Probability and Statistics for Scientists and Engineers, or equivalent.

519 Human Factors Engineering and Ergonomics (3) Application of human factor and ergonomic concepts and principles to design and analysis of work systems. Human as biomechanical system; human information processing; minimization of human error; anthropology, anatomy and physiology; physical and mental workload; effects of environmental factors: temperature, lighting, weightlessness, and vibration on humans; manual materials handling techniques; design of display and controls; design of office ergonomic environment; design of displays and controls; hand tool design; and cumulative trauma injuries. Prereq: Probability and Statistics for Scientists and Engineers I or consent of instructor.

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

521 Advanced Human Factors Engineering Methodology (3) Advanced methodologies used in human factors engineering. Observational methods; function/task analysis; computerized human factors design methods; human reliability and error prediction; evaluation of human-machine interface; modeling techniques; case histories of human factors and safety engineering. Prereq: consent of instructor.

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

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


525 Systems Modeling and Simulation (3) Modeling of discrete systems using current simulation software and Monte-Carlo simulation. Problem definition, input distributions, output data analysis, model validation and verification, variance reduction techniques, animation of models, and design of simulation experiments. Case studies in variety of domains for simulation modeling. Prereq: Consent of instructor.

526 Advanced Applications of Systems Modeling and Simulation (3) Modeling of discrete systems using current simulation software and Monte-Carlo simulation. Problem definition, input distributions, output data analysis, model validation and verification, variance reduction techniques, animation of models, and design of simulation experiments. Case studies in variety of domains for simulation modeling. Prereq: Consent of instructor.

591-92-93 Special Topics in Industrial Engineering (1-3,1-3,1-3) Individual or group research projects. Prereq: Consent of instructor. May be repeated.

594 Culminating Integrated Project Report (3) (Same as Mechanical Engineering 594).

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attribute decision analysis; Bayesian analysis of sequential decision making; artificial intelligence in complex decision analyses. Prereq: 518, 523.

602 Nonlinear Optimization (3) (Same as Management Science 651.)

605 Probabilistic Methods in Engineering Systems (3) Probability and statistical methods to be selected and used. Prerequisites: Probability and Statistics for Scientists and Engineers I or consent of instructor.

606 Advanced Topics in Human Factors, Safety and Biomechanical Engineering (3) Application of advanced human factors analysis and design methods to human error and reliability in in human-systems. Prereq: 519.

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

536 Project Management (3) Development and management of engineering and technology projects. Project proposal preparation; resource and cost estimating; and project planning, organizing, and controlling: network diagrams and other techniques. Role of project manager: team building, conflict resolution, and contract negotiations. Discussion of typical problems and alternative solutions. 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: analysis, work measurement, incentive systems, wage and salary development, production and inventory control, facility layout, linear programming, and other 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 and project, organizational strategy; external factors; commercialization of new technologies; and competition and beyond. Prereq: 533 and Industrial Engineering 518 or consent of instructor.


543 Legal and Ethical Aspects of Engineering Management (3) Legal aspects imposed by government and ethical considerations in engineering practice. Selected readings, lecture, discussion, and student presentations. Current topics from government and industry.

Information Sciences (Office of the Provost)

MAJOR
DEGREE
Information Sciences .................. M.S.

Elizabeth Aversa, Director
Professors:
Aversa, Elizabeth, Ph.D. ............... Drexel
Tenopir, Carol, Ph.D. ................. Illinois
Wilson, P. (Emeritus), Ph.D. ....... Michigan
Associate Professors:
Fisher, Patricia L., Ph.D. .............. Florida State
Pemberton, J. Michael, Ph.D. .............. Tennessee State Department of Education
Pollard, Richard, Ph.D. ...................... Brunel (UK)
Robinson, William C., Ph.D. ............... Illinois
Wang, Peling, Ph.D. ........................... Maryland
Whitney, Gretchen, Ph.D. ................... Michigan

Assistant Professors:
Bilal, Dania, Ph.D. ............................. Florida State
Raber, Douglas, Ph.D. ........................ Indiana
Watson, Jinx, Ed.D. ............................. Vanderbilt

The School of Information Sciences provides a program leading to the preparation of librarians and information professionals for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the Master of Science degree. The program is accredited by the American Library Association. A Ph.D. degree program may also be pursued with a major in Communications, concentration in information sciences. The mission of the school is to educate people to live, work, and flourish in an information society through excellence in teaching, research, and public service in information sciences. The plan for the future of the School of Information Sciences states that “The School of Information Sciences will be recognized nationally and internationally as an interdisciplinary program of excellence in the information sciences. Graduates of the School's programs will be knowledgeable, skillful, and ethical users of information and information technology in their educational, professional, and personal endeavors. They will be well prepared for further study and inquiry, for leadership in the information professions, and for enlightened participation in a global information society. The School's graduates will recognize their responsibilities to contribute new knowledge and to engage in lifelong learning in the field.”

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

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

ADMISSION REQUIREMENTS

Applicants to the Information Sciences program must have a minimum undergraduate grade-point average of 3.0 or a satisfactory graduate degree grade-point average for admission as a potential candidate for the MS degree.

The verbal, quantitative and analytical aptitude portions of the Graduate Record Examination (GRE) are required of all applicants unless a graduate degree has been completed prior to application for admission. Applicants should take the GRE at least one semester in advance of application for admission and are expected to score 1500 points or better.

A personal data sheet and three recommendations (obtained from the School of Information Sciences) should be returned to the admissions office of the school. Foreign applicants are required to take the Test of English as a Foreign Language.

THE MASTER'S DEGREE

The program leading to the Master of Science involves a total of 42 semester hours of graduate courses including 5 courses required of all students. Either a thesis or a non-thesis option is available with 6 hours required for thesis credit. At least 36 hours must be taken in the School of Information Sciences, allowing up to 6 hours outside the school with a maximum of 6 from outside the University.

Required Courses
Five courses are required of all students: 490, 520, 530, 560 and 580. (Students seeking licensure see track requirements below.) These courses address the evolving information environment: organization and representation of information; information access and retrieval; developing and managing collections; and principles and concepts of the information sciences. Three courses, 490, 520 and 530, are prerequisite to all courses for students enrolled in the M.S. degree program.

Individualized Curriculum Approach

Students, in consultation with their advisor, may wish to pursue a curricular focus to develop an individualized program of study. Graduates of the school have prepared themselves for a variety of careers, including positions as: corporate information specialist, public librarian, records manager/archivist, web page designer, online information retrieval specialist, medical or law librarian, reference librarian, youth services specialist, and many others. Students are encouraged to take advantage of the individualized curricular approach.

Whatever individualized curriculum is chosen, all students who complete the program will receive an M.S. degree accredited by the American Library Association (ALA). For those pursuing Tennessee Department of Education licensure as a school library information specialist, stipulated requirements apply. See following section.

Tennessee State Department of Education School Library Information Specialist Requirements

The Tennessee State Department of Education requires School Library Information Specialists to hold the master’s degree. The School of Information Sciences offers four tracks for School Library Information specialist endorsement.

Initial Endorsement for Non-Licensed Teachers with no Master's Degree in Library or Information Sciences: For those students who do not hold the master’s degree, the requirements for initial endorsement include the 5 required courses plus 551, 567, 571, 572, 585, and 595. In addition, students must complete two corequisite courses from the College of Education (5 credit hours) which do not count toward the master’s degree requirements. Students pursuing the initial endorsement must follow the non-thesis option. Upon completion of the requirements, students will earn a master’s degree in Information Sciences and a Tennessee State Department of Education license as a School Library Information Specialist.

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

Additional Endorsement for Licensed Teachers with a Master's Degree: The requirements include the 5 required courses plus 551, 567, 571, 572, 585 and 596 (which must be taken twice). Upon completion of the requirements, students will earn a Tennessee State Department of Education additional endorsement as a School Library Information Specialist.

Additional Endorsement for Licensed Teachers without a Master's Degree: The requirements include the 5 required courses plus 551, 567, 571, 572, 585 and 596 (which must be taken twice) plus 3 electives (upon approval of the faculty advisor). Upon completion of the requirements, students will earn a master’s degree in Information Sciences and a Tennessee State Department of Education additional endorsement as a School Library Information Specialist.

Additional Program Requirements

Thesis Option: Students electing the thesis option will write a master’s thesis under close supervision of a thesis committee. Six hours of Thesis (IS 500) must be taken within the 42 hours required for graduation. (Students may register for more than 6 hours of 500, but only 6 hours will count toward graduation.) Students must be registered for IS 500 in the semester they complete and defend their thesis. The oral defense of the thesis (final comprehensive examination) substitutes for the written examination that is taken by non-thesis students. The writing of the master’s thesis serves as the culminating experience.

Non-Thesis Option: Upon completion of the program, all students who elect the non-thesis option must take and pass a written comprehensive examination. A culminating experience is also required which must be completed in one of the student’s last two
terms with a grade of B or better (except as noted) selected from the following and approved by the student’s advisor: 590 Problems in Information Sciences, 591 Supervised Readings in Information Sciences, 592 Seminar in Information Sciences, 593 Independent Study, 594 Graduate Research Participation (S/NC only), 595 Student Teaching in School Library Information Center (S/NC only), 596 Student Teaching and Observation in School Library Information Center (S/NC only), 599 Practicum (S/NC only).

FINANCIAL ASSISTANCE OPPORTUNITIES

Employment with the University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through subcontracts with Oak Ridge National Laboratory and the Department of Energy.

A limited number of graduate teaching assistantships are available through the school. Assistantships of this type carry a waiver of tuition and fees as well as a stipend and require that recipients work 10 hours per week in the school.

For application forms and information about financial aid and other information about the M.S. in Information Sciences, write to Admissions, School of Information Sciences, University of Tennessee, 804 Volunteer Blvd., Knoxville, TN 37996-4330

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S. program in Information Sciences is available to residents of the states of Arkansas, Virginia, or West Virginia.

Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE COURSES

430 History of the Book (3) History of writing and various methods of bookmarking.
450 Writing About Science, Technology and Media (3) (Same as Journalism 450.)
485 Introduction to Electronic Communications and Information Resources on the Internet (3) Exploration of worldwide information and communication resources: email, newsgroups, and world wide web. Discussion of information issues: copyright, censorship, privacy and access.
486 Advanced Electronic Communications and Information Resources (3) Exploration of advanced information and communications issues, resources and tools: forms, scripting and search engines. Prereq: 485 or consent of instructor.
490 Information Environment (3) Generation, production, presentation, consumption and use of information. Roles of information in society, information seeking and user behavior, information industry, economics of information products and services, technological and organizational change, information professions, and issues. E, A
500 Thesis (1-15) P/NP only. E
502 Registration and Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May not be repeated. S/NC only. E
520 Organization and Representation of Information (3) Principles of describing, indexing, and preparing documents. Introduction to bibliographical tools, electronic cataloging and production and the use of online databases. A
521 Cataloging and Classification (3) Basic library-oriented cataloging techniques, tools, and supporting operations. Descriptive cataloging, choice and form of non-subject entries, subject heading vocabulary, cataloging authority control, bibliographic utilities, online library catalogs.
522 Organization and Representation of Multimedia Information Resources (3) Principles and practice in the description and access to multimedia resources in non-print formats such as visual, auditory, and electronic (including Internet) resources.
523 Abstracting and Indexing (3) Philosophes, standards, and procedures for manual and automated abstracting and indexing. Choice of visual, auditory, and electronic (including Internet) resources.
530 Information Access and Retrieval (3) Media for information storage, logical and physical information structure, query logic and languages, search strategies and heuristics, user interfaces, evaluation of retrieval system performance. Search techniques for various types of databases including multi-media, full-text, numeric, bibliographic. E, A
531 Sources and Services for the Social Sciences (3) Information sources in the social sciences, sociology, psychology, geography, history, anthropology, business, and education.
532 Sources and Services for Science and Engineering (3) Sources and services in science, 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, organization, and utilization of government information in various 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., GIN and Medline, classification schemes and structure databases, content-page full-text databases, patents; document delivery alternatives, evaluation, and testing.
537 Information Industry (3) Issues and trends concerning information industry: products and services. Standards, enabling technologies, choice of distribution media, entrepreneurial opportunities. Legal, ethical, and quality concerns.
538 Economics of Information (3) Costing and pricing of information: value of information and value added services; cost-benefit analysis and tradeoffs: policy issues related to economic aspects of information exchange and transfer.
539 Information Policy (3) Role of government in creation and exchange of information, review of key national and international policy areas relevant to information creation, production, and distribution; development of information policy for organizations.
540 Research Methods (3) Research methods in variety of information environments: primary and secondary research, project design, research results interpretation; analysis of published research; techniques supporting research process.
550 Management of Information Organizations (3) Supervisory and management concepts, strategies, and techniques applicable to information professional working in libraries, archives, records management, and other information organizations.
551 School Library Media Centers (3) Planning, implementing, and evaluating school library programs. Current trends in library technology, site-based management, relationships with district and state services.
552 Academic Libraries (3) Mission, status, and history of academic libraries and academic librarianship in community colleges, universities, and special libraries. Trends in higher education, information technology, and government’s impact on public, technical, and administrative services.
553 Corporate Information Services (3) Development and management of information, objectives, information resources external to organization.
554 Public Library Management and Services (3) Development, roles, political environment, governance, organization, fiscal management, services, marketing, and performance evaluations.
555 Scientific and Technical Communications (3) Evolution of scientific and technical communication; current trends; role of formal and informal communications; major STI organizations and their roles.
557 User Instruction (3) Theory, strategy, design, and practice in providing instructional services and technology for end users of information and information systems. Includes practical experience.
560 Development and Management of Collections (3) Selecting and preserving variety of items (tangible and intangible) for particular users; community analysis; policies and procedures; evaluation; purchasing.
561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution; various types of publishers.
563 Graph Design and Media (3) Principles and practice in visual aspects of communications. Graphic design, typography, production techniques and publication design, as they apply to electronic information delivery systems.
564 Corporate Information Systems (3) Objectives and function elements of records systems, archival programs, management information systems and techniques within various types of organizations. Management of information internal to organizations.
566 Business Intelligence for Information Professionals (3) Principles and practices of gathering and synthesizing business intelligence; competitive intelligence, environmental scanning, and issues management; information evaluation and synthesis; role of strategic information in modern organizations.
567 Information Network Applications (3) Scholarly and community-based electronic communications. National and international standards, tools, resources; identification, analysis, evaluation, and management of tools and resources; construction of local technologies as developed and applicable.
569 Advanced Production of Audiovisual Software (3) (Same as Education in the Sciences, Mathematics, Research and Technology 569.) F, S, Sp
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, listing, and viewing guidance for individuals and
groups. Program planning, implementation, and evaluation. Prereq: 571 or 572.

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

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

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

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, serials control, systems planning and implementation.

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

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. Sp

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

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

588 Human-Computer Interaction (3) Survey of human-computer interaction and introduction to human and technological factors of importance to design of usable information systems. Basic phenomena of human perception, cognition, memory, and problem solving, and relationship to user-centered design. Methods and techniques for interaction design and evaluation. Sp


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

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

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

593 Independent Study (3-6) Prerequisite: Consent of advisor. Maximum 6 hrs. F,Sp

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. F,Sp

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

596 Field-Based Experience in School Library Information Centers (2) Prescribed activities to gain competencies in a school library information center setting. Must be taken twice. May be repeated. Maximum 6 hrs. S/NC only.

599 Practicum (3-6) Opportunity to translate theory into practice under guidance of qualified information professionals. Prereq: Completion of core and pertinent advanced courses relevant to student’s practicum design. Minimum 3.0 cumulative GPA. Written consent of advisor and approval of practicum coordinator. May be repeated. Maximum 6 hours. S/NC only. E

601 Advanced Seminar in Information Sciences (3) Theories, research, and traditional practices of information representation, organization, and access and retrieval. Research opportunities and methods. Relationship to and interaction with other disciplines.

**GRADUATE COURSES**

475 Utilization of Instructional Media (3) Basic concepts of communication and instructional development for improving instruction through use of media. F,Sp

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

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


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

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

521 Computer Applications in Education (3) Use and integration of technology in educational settings to support teaching and learning. Prereq: Basic computer operations or consent of instructor. F

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

535 Program Evaluation in Education (3) Issues and practices in planning and conducting program and curriculum evaluation in variety of settings. Fundamentals of design, measurement, philosophy, ethics, and underlying values; proper role and use of evaluation in educational organizations. Prereq: consent of instructor. (Same as Higher Education 534.) Sp,Su

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

552 School Law for Educators (3) Case and statutory material for public school educators; problems concerning law and public education.

557 The Junior High and Middle School Curriculum (3) Curriculum and instructional design for junior high and middle school. Characteristics of students, curriculum designs, instructional patterns, and organization and structure of junior high and middle school. 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 Student Assessment (3) Processes for assessing and reporting student progress; interpretation and use of available assessment data. Methods of assessment other than tests and measurements; portfolios, performance tasks, exhibitions. F

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

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

569 Media and Technology Production Techniques (3) Workshop strategy: basic photography, audio production, multi and single camera TV production, basic digital video editing, and other media/technology techniques important for improving communication in
variety of presentation or instructional settings. (Same as Information Sciences 569.) Su

570 Instructional Systems Design (3) Application of theory and research of instructional systems design to solve instructional problems in educational settings. F

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

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

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

576 Advanced Interactive Multimedia for Instruction (3) Design and production of educational and interactive Web sites using advanced software. Development of effective interactive methods for enhancing teaching and learning, supported by principles of planning, designing, creating, testing, and evaluating. Prereq: 521, 570, 573, 575. Sp

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

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

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

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

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

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

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

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

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

671 Advanced Educational Statistics (3) Applications of parametric and non-parametric statistical inference to educational and instructional problems. Use of microcomputers in educational research. Prereq: 581, F, Sp

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

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

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


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

679 Trends and Issues in Instructional Technology (3) Literature: history and origins, integration and application, teacher preparation, future developments, diffusion of change and philosophical/theoretical perspectives. F

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

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

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

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

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

Interdisciplinary Programs

The College of Arts and Sciences offers a series of interdisciplinary undergraduate majors and minors through its Interdisciplinary Programs. These programs include:

African and African-American Studies

American Studies

Asian Studies

Cinema Studies

Comparative Literature

African and African-American Studies

GRADUATE COURSES


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

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

Asian Studies

GRADUATE COURSES

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

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

Cinema Studies

GRADUATE COURSES

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

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

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

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

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

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

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

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

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

Comparative Literature

GRADUATE COURSES

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

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

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

510 Special Topics (3) May be repeated. Maximum 6 hrs.
**Latin American Studies**

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>456</td>
<td>Latin American Government and Politics (3) (Same as Political Science 456.)</td>
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<tr>
<td>465</td>
<td>Latin American Film and Culture (3) (Same as Spanish 465 and Cinema Studies 465.)</td>
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<tr>
<td>479</td>
<td>Disenched Texts in Hispanic Literature (3) (Same as Spanish 479.)</td>
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<tr>
<td>510</td>
<td>Special Topics (3) May be repeated. Maximum 6 hrs.</td>
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**Legal Studies**

**GRADUATE COURSES**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>400</td>
<td>Mass Communications Law and Ethics (3) (Same as Communications 400.)</td>
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<tr>
<td>430</td>
<td>United States Constitutional Law: Sources of Power and Restraint (3) (Same as Political Science 430.)</td>
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<tr>
<td>431</td>
<td>United States Constitutional Law: Civil Rights and Liberties (3) (Same as Political Science 431.)</td>
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<td>442</td>
<td>Administrative Law (3) (Same as Political Science 442.)</td>
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<td>451</td>
<td>Criminal Justice (3) (Same as Sociology 451.)</td>
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<td>455</td>
<td>Society and Law (3) (Same as Sociology 455.)</td>
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<tr>
<td>470</td>
<td>International Law (3) (Same as Political Science 470.)</td>
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<tr>
<td>490</td>
<td>Language and Law (3) (Same as English 490 and Linguistics 490.)</td>
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<tr>
<td>496</td>
<td>The Rhetoric of Legal Discourse (3) (Same as English 496.)</td>
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**Linguistics**

**GRADUATE COURSES**

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<tr>
<th>Course Code</th>
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<th>Prerequisites</th>
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<tbody>
<tr>
<td>400</td>
<td>Topics in Linguistics (3) Content varies. May be repeated. Maximum 6 hrs.</td>
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<tr>
<td>411</td>
<td>Linguistic Anthropology (3) (Same as Anthropology 411.)</td>
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<tr>
<td>423</td>
<td>The Development of Diachronic and Synchronic Linguistics (3) Development of Western linguistic thought from Hebrews and Greeks through modern times. Readings from Boas, Sapir, Bloomfield, and others. Prereq: 9 hrs of courses required for Linguistics major (300-level or above) or consent of instructor.</td>
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<tr>
<td>425</td>
<td>Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, and Spanish 425.)</td>
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<tr>
<td>426</td>
<td>Methods of Historical Linguistics (3) (Same as German 426, French 426, and Spanish 426.)</td>
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<tr>
<td>429</td>
<td>Romance Linguistics (3) (Same as French 429 and Spanish 429.)</td>
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<td>431</td>
<td>Topics in Hispanic Linguistics (3) (Same as Spanish 430.)</td>
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<td>435</td>
<td>Structure of the German Language (3) (Same as German 435.)</td>
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<tr>
<td>436</td>
<td>History of the German Language (3) (Same as German 436.)</td>
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<tr>
<td>471</td>
<td>Sociolinguistics (3) (Same as English 471 and Sociology 471.)</td>
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<tr>
<td>472</td>
<td>American English (3) (Same as English 472.)</td>
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<td>474</td>
<td>Teaching English as a Second or Foreign Language I (3) (Same as English 474.)</td>
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<tr>
<td>475</td>
<td>Teaching English as a Second or Foreign Language II (3) (Same as English 475.)</td>
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<td>476</td>
<td>Second Language Acquisition (3) (Same as English 476.)</td>
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<td>477</td>
<td>Pedagogical Grammar for ESL Teachers (3) (Same as English 477.)</td>
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<tr>
<td>485</td>
<td>Special Topics in Language (3) (Same as English 485.)</td>
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<tr>
<td>490</td>
<td>Language and Law (3) (Same as English 490 and Legal Studies 490.)</td>
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<tr>
<td>510</td>
<td>Special Topics (3) May be repeated. Maximum 6 hrs.</td>
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**Medieval Studies**

**GRADUATE COURSES**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>510</td>
<td>Special Topics (3) May be repeated. Maximum 6 hrs.</td>
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</table>

**Women’s Studies**

**GRADUATE COURSES**

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<tbody>
<tr>
<td>400</td>
<td>Topics in Women’s Studies (3) Content varies. May be repeated. Maximum 6 hrs.</td>
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<tr>
<td>410</td>
<td>Gender Role Development: Implications for Education and Counseling (3) (Same as Counselor Education and Counseling Psychology 410.)</td>
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<tr>
<td>422</td>
<td>Women Writers in Britain (3) (Same as English 422.)</td>
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<tr>
<td>425</td>
<td>Women’s Health (3) (Same as Health 425.)</td>
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<tr>
<td>434</td>
<td>Psychology of Gender (3) (Same as Psychology 434.)</td>
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<tr>
<td>466</td>
<td>Rhetoric of the Woman’s Rights Movement to 1930 (3) (Same as Speech Communication 466.)</td>
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<tr>
<td>469</td>
<td>Sexuality and Cinema (4) Exploration of issues surrounding sexuality, gender and cinema from points of view of feminist film criticism. (Same as Cinema Studies 469.)</td>
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<tr>
<td>476</td>
<td>Rhetoric of the Contemporary Feminist Movement (3) (Same as Speech Communication 476.)</td>
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<tr>
<td>483</td>
<td>African-American Women in American Society (3) (Same as African and African-American Studies 483.)</td>
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<tr>
<td>510</td>
<td>Special Topics (3) May be repeated. Maximum 6 hrs.</td>
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**Journalism**

**GRADUATE COURSES**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
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<tbody>
<tr>
<td>403</td>
<td>International Communications (3) Development and operations of world mass communications channels and agencies. Comparative analysis of media, media practices, and flow of news throughout world. Print and broadcast systems in terms of relevant social, political, economic, and cultural factors. Relation of communication practices to international affairs and understanding.</td>
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<tr>
<td>412</td>
<td>Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines and company publications: study and use of rhetorical devices and logic. Prereq: Writing for Mass Communication or consent of instructor. (Same as Public Relations 412.)</td>
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<tr>
<td>414</td>
<td>Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Organizing and presenting material, problems in specialized areas: business, science, agriculture, humanities. Prereq: Writing for Mass Communication or consent of instructor.</td>
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<tr>
<td>416</td>
<td>Issues in Journalism (3) Topics vary. Prereq: of instructor. May be repeated. Maximum 6 hrs.</td>
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420 Print Media Management (3) Current business practice among print news media, especially newspapers. Problems in management and production and outlook for new technologies. Prereq: 6 hrs math, statistics and/or accounting and senior standing. Sp


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

444 Journalism as Literature (3) Study of writers from 17th century to modern era whose works have endured as both journalism and literature. Emerging genre called literary journalism: means of cultural reporting with personal narrative style. Prereq: Consent of instructor.

450 Writing About Science, Technology, and Medicine (3) Writing workshop to analyze examples of successful science writing and write series of articles for general public based on scientific journals, news conferences, technical meetings, and interviews. Prereq: Consent of instructor. (Same as Information Sciences 450.)

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

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

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


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

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

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

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

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

550 Writing and Editing Projects (3) Specialized writing or editing interests: agriculture, politics, labor, finance, science, technical, governmental publications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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


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.

Public Relations

GRADUATE COURSES

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

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

470 Public Relations Campaigns (3) Research, planning and communication and evaluation of major public relations campaigns. Oral and written presentation and order of design, project from inception to completion. Extended out of class work. Prereq: 320 Public Relations Communications and 370. Public Relations Cases or consent of instructor. F-Sp

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

520 Political Communications (3) (Same as Journalism 520.)

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

530 Fund Raising and Proposal Writing (3) History, philosophy and practice of philanthropy in U.S. Sources of funds from foundations, corporations and public agencies. Research and preparation of fund-raising proposals.

560 Publishing on World Wide Web (3) (Same as Journalism 560.)

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

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

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

Large Animal Clinical Sciences

See College of Veterinary Medicine and Comparative and Experimental Medicine

Law

(College of Law)

MAJOR DEGREES

LAW: J.D., J.D.-MBA, J.D.-M.P.A.

Thomas C. Galligan, Jr., Dean

Professors:

Ansley, Frances Lee, LL.M........... Harvard
Best, Reba, M.L.S. ..................... Florida
Blaze, Douglas A., J.D.........!!!!! Georgetown
Cohen, Neil P., LL.M................... Harvard
Cook, Joseph G., LL.M.................. Yale
Galligan, Jr., Thomas C., LL.M...... Columbia
Hardin, Patrick, J.D. .................. Chicago
Hess, Amy M., J.D. .................... Virginia
King, Joseph H., J.D. ................. Pennsylvania
Le Clercq, Frederic S. (Emeritus), LL.B., Duke
Lloyd, Robert M., J.D. ............... Michigan
Phillips, Jerry J., J.D. ................. Yale
Piquet, Cheryn, M.S.L.S. .......... Tennessee
Rewald, Glenn H., J.D. .......... Yale
Rivkin, Dean H., J.D. ................. Vanderbilt
Sobieski, John L., Jr., J.D. ........... Michigan
Stark, Barbara, J.D. ................. New York
Stein, Gregory M., J.D. .............. Columbia
Stephens, Otis H., J.D. .............. Tennessee
Wirtz, Richard S., J.D. .............. Stanford
Zwier, Paul J., II, LL.M.............. Temple

Associate Professors:

Aarons, Dwight, J.D. ............. UCLA
Anderson, Gary L., LL.M ............ Harvard
Barton, Benjamin H., J.D. ........... Michigan
Beintema, William J., J.D. ........ Mami
Black, Jerry P., Jr., J.D. ........... Vanderbilt
Cornett, Judy M., J.D. .............. Tennessee
Davies, Thomas Y., J.D. .......... Northwestern
Gray, Grayfred B., J.D. .............. Vanderbilt
Heminway, Joann M., J.D. ........... New York
Kennedy, Deseree A., LL.M. ........ Temple
Kuney, George W., J.D. (Hastings) Leatherman, Don A., LL.M ........ New York
Medill, Colleen E., J.D. ............ Kansas
Parker, Carol M., J.D. ............... Illinois
Pierce, Carl A., J.D. ................. Yale
Plank, Thomas E., J.D. ............. Maryland
Pulsinelli, Gary A., J.D. (Boalt Hall) White, Penny J., LL.M ................ Georgetown
Williams, Paulette J., J.D. ......... New York

Assistant Professors:

Cochran, Cathleen R., M.S. ......... Tennessee
Collins, Carol Morgan, M.S. ...... Tennessee
Davis, Melinda D., M.S.L.S. ...... North Carolina
Marshall, Sibyl D., J.D. .............. Loyola
Price, Loretta, M.S.L.S. ............ Tennessee

The College of Law offers the Doctor of Jurisprudence degree program; a dual degree program with the College of Business Administration leading to the J.D. and the Master of Business Administration degree; and a dual degree program with the Department of Political Science, College of Arts and Sciences, leading to the J.D. and Master of Public Administration. In addition graduate students may be eligible to take a limited number of law courses to count toward a graduate degree.

Current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available from the Admissions Office, The University of Tennessee, College of Law, 1505 W. Cumberland Ave., Knoxville, Tennessee 37996-1810. Completed application should be received before February 1 of the year of requested admission.
DEGREE OF DOCTOR OF JURISPRUDENCE

The degree of Doctor of Jurisprudence will be conferred upon candidates who complete, with the required average, six semesters of resident law study and who have 89 semester hours of credit, including all required courses. The required average is 2.0 and that average must be maintained on the work of all six semesters and also for the combined work of the grading periods in which the last 28 credit hours taken in residence were earned. Averages are computed on weighted grades. Grades are on an alphabetical scale from A+ to F. No credit toward the J.D. degree is awarded for grades of D- or F.

Eligible law students may receive up to six (6) semester hours of credit toward the J.D. degree for acceptable performance (a grade of B or higher) in upper-level courses that materially contribute to the study of law and which are taken in other departments at The University of Tennessee. Course selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit toward a graduate degree in the department offering the course. Refer to the Law Catalog and Student Handbook for current degree requirements.

Concentration in Business Transactions

Students interested in a concentration in business transactions must complete all of the following law courses:

818 Fundamental Concepts of Income Taxation
826 Introduction to Business Transactions*
827 Business Associations
972 Income Taxation of Business Organizations
940 Land Finance Law
940 Commercial Law
842 Contract Drafting Seminar
833 Representing Enterprises

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

Concentration in Advocacy and Dispute Resolution

Students interested in a concentration in advocacy and dispute resolution must complete all of the following courses:

813 Evidence
815 Introduction to Advocacy and Professional Responsibility
905 Advocacy Clinic
920 Trial Practice
921 Pretrial Litigation
922 Advanced Trial Advocacy
928 Case Development and Resolution

Students electing a concentration in advocacy and dispute resolution may not take any of the above courses on an S/NC basis.

DUAL J.D.-MBA DEGREE PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferment of both the Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student approximately 15 hours (one semester) over the time that would be required to earn both degrees independently. The establishment of the dual program recognizes the increasingly complex body of knowledge necessary to the creative conduct of business and business-related law practice, the complementary nature of many aspects of the graduate programs of the College of Law and the College of Business Administration, and the intellectual benefits inherent in the concurrent study of both business and business-related law. The program is designed to accommodate the interests of students who (a) contemplate a career in public service and want to acquire the skills and perspective of the lawyer and the business-oriented manager, (b) contemplate a career in business management and want to acquire the skills and perspective of a lawyer, or (c) contemplate a career as a lawyer specializing in business-related law and want to acquire the skills and perspective of the business-oriented manager.

Admission Requirements

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

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies are started prior to entry into the last 28 semester hours of J.D. coursework and prior to the third semester of the MBA program. Students interested in entering the dual program should submit a letter of application to the Dual Program Committee. Upon receipt of the application, the Dual Program Committee will determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

Curriculum

A dual program candidate must satisfy the graduation requirements of each college. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit toward other programs. Students interested in entering the dual program should submit a letter of application to the Dual Program Committee. Upon receipt of the application, the Dual Program Committee will determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

CURRICULUM

A dual program candidate must satisfy the graduation requirements of each college. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit toward other programs. Students interested in entering the dual program should submit a letter of application to the Dual Program Committee. Upon receipt of the application, the Dual Program Committee will determine eligibility and assign students to advisors who will be responsible for course approval and supervision of the student's progress through the dual program.

Curriculum

A dual degree candidate must satisfy the requirements for both the J.D. and the M.P.A. degree 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
students enrolled in a graduate degree program.

Different rules apply to the student enrolled in the Dual J.D.-MBA or J.D.-M.P.A. Programs. Grades must be earned according to the grading system of the respective college, e.g. numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulative records 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; frustration of purpose; remedies; third party beneficiaries; and assignment and delegation. Considerable coverage of Article 2 of the Uniform Commercial Code.

804 Contracts II (3) Continuation of Contracts I. Issues arising after contract formation: interpretation, duty of good faith; conditions; impracticability and frustration of purpose; remedies; third party beneficiaries; assignment and delegation. Considerable coverage of Article 2 of the Uniform Commercial Code with respect to remedies, anticipatory repudiation, impracticability and good faith.

805 Legal Process I (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, defenses and privileges related to intentional torts; negligence: standard of care; duty of care; proximate cause; damages.

808 Torts II (3) Vicarious liability and related concepts; strict liability for dangerous animals and abnormally dangerous activities; products liability; nuisance, defamation and invasion of privacy; economic torts: misrepresentation and interference with contract and prospective opportunities; immunity: those of government, governmental employees, charities and family members, and damages.

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.

812 Constitutional Law (4) Fundamental principles of American constitutional law: federalism, separation of powers, equal protection of law, and constitutional protection of other fundamental individual rights.

813 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. Coreq: 920 for students electing concentration in advocacy.

814 Legal Profession (3) Legal, professional and ethical standards applicable to lawyers. Not open to students who have taken 815.

815 Introduction to Advocacy and Professional Responsibility (3) Theory and morality of advocacy in adversarial system, and legal, ethical, and professional standards applicable to lawyers and especially lawyers as advocates.

818 Fundamental Concepts of Income Taxation (3) Introduction to basic statutory analysis, fundamental principles of federal individual income tax, and perversive individual income taxation. Federal concept of gross income, pattern of exclusions, exemptions and deductions from gross income used to arrive at tax base; special treatment of capital gains and losses; and rate structure.

819 Economic Principles of Income Taxation (3) Survey of time value of money and related economic principles in federal income tax system. Taxation of employment compensation, retirement and other beneficencies, federal and state social insurance programs, and of various financial arrangements and products, and introduction to tax accounting. Prereq: 818.

821 Administrative Law (3) Administrative agency decision-making processes and judicial review of administrative action. Theories of standards for informal and formal administrative adjudication and rule-making (attention to federal Administrative Procedure Act, constitutional versus administrative standards in both realities of legislative process and applicable constitutional principles.

826 Introduction to Business Transactions (2) Non-technical introduction to accounting, finance, and the function of financial institutions and the various actors in business transactions. Analysis of business transactions with view toward needs of business clients. Not available for students with business background.

827 Business Associations (4) Legal problems associated with raising of capital by new and growing enterprises; securities transactions by promoters, officers, directors and others; regulation of public-held companies; litigation under Rule 10b-5 and other antifraud provisions, and protection of creditors, managers, and shareholders of limited liability companies, and corporate shareholders, directors, and officers; and others with whom members interact in connection with firm’s business.

828 Corporate Finance (3) Legal issues arising in conjunction with corporate financial transactions: issuance of debt and various types of equity securities, distributions to shareholders, mergers and other corporate acquisitions. Legal valuation of corporate securities.

830 Securities Regulation (3) Basic structure of federal securities law. Legal problems associated with raising of capital by new and growing enterprises; securities transactions by promoters, officers, directors and others; regulation of public-held companies; litigation under Rule 10b-5 and other antifraud provisions, and protection of creditors, managers, and shareholders of limited liability companies, and corporate shareholders, directors, and officers; and others with whom members interact in connection with firm’s business.

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

834 Antitrust (3) Federal antitrust laws; monopolization, price fixing, blockbusters, and anticompetitive practices generally; government enforcement techniques and private treble damage suits.

840 Commercial Law (4) Basic coverage of most significant provisions of Uniform Commercial Code.
security interests in personal property (Art. 9 of U.C.C. and relevant Bankruptcy Code provisions); commercial paper, including checks, notes and other negotiable instruments; sales of goods, including coverage of portions of Art. 2 of U.C.C. not covered in Contracts.

842 Contract Drafting Seminar (2) Practical fundamentals of drafting contracts of different types.

843 Debtor-Creditor Law (3) Basic elements of federal bankruptcy law: claims, property of estate, automatic stay, fraudulent avoidance powers, assumption and rejection of contracts, priority of distributions, and distinction between liquidation and rehabilitation. Enforcing judgments outside of bankruptcy.

847 Advanced Constitutional Law (2-3) Advanced study of U.S. Constitution and U.S. constitutional law. Specific course offerings vary. Subjects include: constitutional structure of American governmental institutions, federalism, separation of governmental powers: relationship between legislative and executive branches, relationship among states and between states and federal government, and constitutional amendment process; state constitutional law, Tennessee constitution and differences between state and federal constitutional law; Bill of Rights and 14th Amendment to Constitution; Bill of Rights as protected by Bill of Rights and 14th Amendment. Prereq: 812. May be repeated under different topic.

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

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

850 Supreme Court (3) History of Supreme Court and of procedures by which Court arrives at decisions; influences of justices’ ideology and role of Court in public political.

854 Criminal Procedure I (3) Police practices and constitutional rights of persons charged with crimes; arrest; search and seizure; identification; interrogation and confessions; electronic eavesdropping; and right to counsel.

855 Criminal Procedure II (3) Pre- and post-trial procedures in a criminal case: bail; preliminary hearing; grand jury; prosecutorial discretion; discovery; speedy trial; plea bargaining; trial; double jeopardy; and post-conviction relief. Federal Rules of Criminal Procedure.

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

862 Family Law (3) Survey of laws affecting formal and informal family relationships; premartial disputes; ante-nuptial contracts; creation of common law and formal marriage; legal effects of marriage; support obligations within family; legal separation, annulment, divorce, alimony, and property settlements; child custody and child support; abortion; illegitimacy.

863 Children and the Law (3) Legal relationships between children, families and state; juvenile justice; foster care; adoption; educational issues: special education; child abuse and neglect; health care and income maintenance; advocacy for children and families.

866 Environmental Law and Policy (3) Study, through readings, simulations, and analysis, of responses of legal system to environmental problems: environmental litigation; Clean Air Act; Clean Water Act; National Environmental Policy Act; and selected regulatory issues.

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

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

877 Jurisprudence (3) Critical or comparative examination of legal theories, concepts, and problems: legal positivism; natural law theory; legal realism; idealism; historical jurisprudence; utilitarianism; Kantianism; sociological jurisprudence; policy science; and critical studies.

879 Law and Economics (3) Relationship between legal and economic thought; application of basic economic concepts to economic analysis; legal decisionmaking; scholarly support for and criticism of economic analysis of law. Designed for students with no undergraduate background in economics or mathematics.

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

886 Public International Law (3) Law-creating processes and doctrines, principles and rules of law that affect states and other entities in international system.

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

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

896 Employment Law (3) Legal regulation of employment relationship: legal, social and economic influences in employment discrimination; regulation of employment discrimination; legally prescribed minimum standards of compensation and safety; restraints on termination of employment; regulation of retirement sys-

898 Arbitration Seminar (3) Arbitration of labor agreements: judicial and legislative developments; nature of process; relationship to collective bargaining; selected arbitration problems on various topics under collective agreements; and role of lawyers and arbitrators. Prereq: 895.

899 Labor Relations Seminar (2) Selected labor relations law problems. Prereq: 895.

905 Advocacy Clinic (6) Supervised fieldwork requiring students to assume substantial responsibility for representing clients in civil and criminal legal problems. Exploration and development of fundamen-

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

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

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

918 Remedies (3) Judicial remedies: damages, restit-

920 Trial Practice (3) Litigation through simulation, trial problems and preparation: basic trial strategy; profes-

922 Advanced Trial Advocacy (3) Study and development of trial skills: trial preparation, advanced direct and cross-examination, expert witnesses, jury selection, instruction, testimony, and motion practice. Prereq: 920.

927 Interviewing, Counseling and Negotiation (3) Development of conceptual and practical frameworks for understanding interviewing, counseling and nego-

928 Case Development and Resolution (4) Theory and development of skills for case development and resolution: interviews, counseling, and fact investigation. Ways of resolving disputes without litiga-

935 Gratuitous Transfers (4) Nature, creation, termina-

937 Estate Planning Seminar (2) Estate planning problems: relationship to tax planning of law and practice of fiduciary administration, insurance, prop-

940 Land Finance Law (3) Financing devices: mort-

941 Land Acquisition and Development Seminar (2) Seminar in representation of various parties: sellers, buyers, construction lenders, permanent lenders, archi-

942 Land Use Law (3) Private land use controls: nuisance, easements, real covenants, equitable servitudes and home association owners; public land use controls: zoning, subdivision controls, eminent do-

943 Computers and Law (3) Impact of computers on law and practice of law: expert systems; legal skills required in building expert systems; common law office uses of computers; and computerized research. Prepara-

956 Entertainment Law (3) Role of law and lawyer in entertainment industry. Course content varies. Music industry: music copyright laws; artist/manager relationships; recording contract negotiations; industry labor unions; and performing right organizations.

957 Law, Science and Technology (3) Legal implica-

958 Women and The Law (3) Treatment and status of women in American legal history; historical role of female actors, as family members, as participants in workforce, as targets of violence and as members of legal profession; introduction to current competing ap-

961 Legal Research and Writing (2) Research and writing skills for understanding statutory development and drafting documents. Limited enrollment. Prereq: 935 and 973. Recommended prereq: 818.

962 Environmental Law (3) Environmental law and policy; federal and state legal mechanisms of protection and regulation.

963 Environmental Law Seminar (2) Environmental law and policy; federal and state legal mechanisms of protection and regulation.

964 Environmental Law Seminar (2) Environmental law and policy; federal and state legal mechanisms of protection and regulation.

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967 Environmental Law Seminar (2) Environmental law and policy; federal and state legal mechanisms of protection and regulation.

968 Environmental Law Seminar (2) Environmental law and policy; federal and state legal mechanisms of protection and regulation.
959 Intellectual Property (3) Intellectual property and related interests under federal and state law: patents; trademarks; trade secrets; copyright; right of publicity; unfair competition.


962 Law and Medicine Seminar (2) Effects of legal rules on delivery and quality of medical care: nature of physician/ patient relationship; method of practice of medicine; medical education, licensing and specialization; hospital staff privileges; medical malpractice liability; standard of care, proximate cause, defenses, and damages; protection of patient autonomy; consent, informed consent, conception and abortion, choice of treatment, and death and dying; control of communicable diseases; organ transplants and medical resource allocation.


973 Wealth Transfer Taxation (3) Taxation of gratuitous transfers of wealth during life (gift tax) and at death (estate tax) and of generation skipping transfers. Prereq or coreq: 435.

975 Tax Theory (3) Method and purposes of governmental revenue collection through examination of economic and political theory; comparative analysis of various actual and proposed patterns of taxation: income tax; consumption tax; sales tax; and value-added tax. Required preparation of expository essay on aspect of tax theory chosen by student. Limited enrollment.

978 Transactional Tax Planning (3) Advanced study of taxation of business acquisitions, tax planning for financially troubled entities, and review of recent transactions involving cutting-edge tax planning and shaping changes in law. Limited enrollment. Prereq: 818 and 972.

980 Insurance (3) Types of insurance: life, property, health, accident and liability insurance; regulation of insurance industry; interpretation of insurance contracts; insurable interest requirement; conditions, warranties and representations; coverage and exclusions; duties of agents; excess liability; subrogation; and bad faith actions against insurers. Liability insurance: general liability, professional liability, product liability, professional malpractice. Health, accident and liability insurance; regulation of insurance industry; interpretation of insurance contracts. Prereq: 600 or 601.

985 Workers' Compensation (3) Workers' Compensation system for compensating victims of work-related accidents and diseases: requirements for coverage, employee eligibility, employer liability, employee injuries or occupational diseases arising out of and in course of employment; causation; nature of medical disability; benefits; exclusions; classification of compensable injuries or occupational diseases; notice and cooperation requirements; duties of employers; excess liability; subrogation; and bad faith actions against insurers. Liability insurance: general liability, professional liability, product liability, professional malpractice. Health, accident and liability insurance; regulation of insurance industry; interpretation of insurance contracts. Prereq: 600 or 601.

990 Issues in the Law (3) Selected topics. May be repeated.

991 Issues in the Law Seminar (2) Selected topics. May be repeated.

993 Directed Research (1-2) Independent research and writing under direct supervision of faculty member. Proposals must be approved by supervising faculty member and by the Dean or the Dean's designee. 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. Proposals must be approved by supervising faculty member and by the Dean or the Dean's designee. Maximum of once each semester during last three semesters of study.

996 Law Review (1) Performance of duties as staff member or editor of Tennessee Law Review. Responsibilities include preparing formal and informal research notes, consumer comment, or article, and/or performance of other assigned editorial labor. Students are sponsored in Tennessee Law Review. Completion of potentially publishable comment or article for Tennessee Law Review satisfies expository writing requirement. May be repeated. S/C only. (Does not count toward total number of elective upper division courses taken S/N/C.)

997 Moot Court (1) Participation as member of faculty-supervised interscholastic moot court competition. May be repeated. S/N/C only. (Will not count toward total number of elective upper division courses taken S/N/C.)

998 Planning and Drafting Project (1) Preparation and completion of planning and drafting project under faculty supervision in conjunction with substantive courses when such planning and drafting option is provided by course instructor. May be repeated.

Life Sciences (College of Arts and Sciences)

MAJOR DEGREES

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

Jeffrey Becker, Chair

The program leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate and are designed to augment offerings of individual departments in two concentrations: genome science and technology, and plant science and genetics. Students interested in these areas should contact either the Life Sciences chairperson or the director of the area of interest. Each concentration is administered separately and has unique admission requirements.

CONCENTRATIONS

Genome Science and Technology
The University of Tennessee–Oak Ridge National Laboratory Graduate School of Genome Science and Technology (GST) is a unique and multidisciplinary program for full-time graduate study leading to the M.S. or Ph.D. degree. The program focuses on developments in the biological and computational sciences relating to genome sequences, and the program is designed to take advantage of collaboration of The University of Tennessee and the Oak Ridge National Laboratory. Students will be trained in emerging areas of genome science, with emphasis on mammalian genomics, structural biology, proteomics, computational biology and bioinformatics, and bioanalytical technologies. Scientists from both campuses and labs will participate in projects pursued for either the M.S. or Ph.D. degrees are mentored jointly by a faculty member from each campus. A year-long introductory course in Genome Science and Technology focuses on inquiry conducted on a genome-wide scale. Laboratory rotations during the first year offer students hands-on experience in a variety of focus areas.

Applicants are expected to have a background in the biological, physical or computational sciences. Requirements for admission are one year of general biology or the equivalent; two years of chemistry, including one year of general chemistry and one year of introductory organic chemistry with laboratory; one year of calculus; one year of physics; at least eight semester hours in cognate science courses; the program; a combined GRE score of 1800 for the verbal, quantitative, and analytical sections is highly desirable; three letters of recommendation; and a minimum grade point average of 3.0 out of 4.0. Coursework in genomics, cell biology, genetics, or plant sciences is advantageous. Superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the program admissions committee. Deficiencies will be made up as a part of the courses taken by the individual student.

Requirements for the Ph.D. degree are satisfactory completion of the genome science and technology core courses, (Life Sciences 505, 515-16, 520-21, 540-41; Biochemistry and Cellular Molecular Biology 511 and 512; four semesters of GST laboratory, satisfactory completion of formal advanced courses in the areas of the student's interest, passing both written and oral comprehensive examinations, a dissertation reporting the results of original and significant scientific research (a minimum of 24 semester hours of course work is required), a final oral/written examination on the dissertation, and a formal seminar presentation of the dissertation research. Participation in at least one seminar during each semester of residence after the first year is strongly recommended. 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.

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. Solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant sciences are the focus. Admission requirements are a Bachelor's degree with a major in a biological, behavioral, or physical science; GRE (general) score; three letters of recommendation; and coursework including a year of calculus (differential and integral), one year of chemistry and a year of physics. Specific course deficiencies may be corrected during the first year.

Required courses are Life Sciences 510; Botany 521, 522; Biochemistry and Cellular Molecular Biology 511, 512; Plant Sciences and Landscape Systems 471 or Ecology and Evolutionary Biology 560; Microbiology 410. The master's degree requires a minimum of 30 semester hours of study approved by the student's committee, a thesis, and an oral examination. A minimum of 24 semester hours of course work is required. Proposals must be approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a defense of dissertation.
MANAGEMENT

(Graduate School of Business Administration)

MAJOR DEGREES

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

Oscar Fowler, Head

Professors:

Boling, Ronald W. (Emeritus), Ph.D. ... Stanford

Dewhurst, H. Dudley (Emeritus), Ph.D. ... Texas

Gilbert, Kenneth C., Ph.D. .......... Tennessee

James, Lawrence R. (Pilot Chair of

Excellence), Ph.D. ..................... Utah

Judge, William Q., Ph.D. ............. North Carolina

Keally, A. H. (Emeritus), MBA ... Pennsylvania

Ladd, Robert T., Ph.D. .............. Georgia

Larsen, John M., Jr. (Emeritus), Ph.D. ... Purdue

Miller, Alex (W. B. Stokely Prof.),

Ph.D. ......................... Washington

Neel, C. Warren, Ph.D. .......... Alabama

Noon, Charles E., Ph.D. .......... Michigan

Rentsch, J. R., Ph.D. ............... Maryland

Rush, Michael C., Ph.D. ............ Akron

Srinivasan, M. M., Ph.D. .......... Northwestern

Stahl, Michael J., Ph.D. .......... Rensselaer

Vance, S. C. (Emeritus) (W.B. Stokely Prof.),

Ph.D. ............................ Pennsylvania

Whitlock, G. H. (Emeritus) (Distinguished

Prof.), Ph.D. ..................... Tennessee

Woehr, D. J., Ph.D. ............. Georgia Tech

Associate Professors:

Bowers, Melissa R., Ph.D. ............ Clemson

Edringsinge, Chanaka P., Ph.D. .... British

Columbia

Elenkov, Detelin S., Ph.D. ............ MT

Fowler, Oscar S., Ph.D. ............. Georgia

Haley, Usha C. V., Ph.D. .......... New York

Assistant Professor:

Smith, Anne D., Ph.D. .............. North Carolina

BUSINESS ADMINISTRATION

CONCENTRATIONS

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

MBA Concentration: Operations Manage-
ment

Minimum course requirements: 540, 541, and one course from the following: Management Science 526, 551, Statistics 566, Industrial Engineering 522, 526, or an applicable course approved by designated faculty.

Ph.D. Concentration: Management

Minimum course requirements are: For operations management -- 541 and 542; two semesters of 640 (may be repeated for credit); one additional semester of approved doctoral seminar work. For strategic management -- 610, 611, 612, 613.

MINOR IN ENVIRONMENTAL POLICY

The department participates in a program designed to give graduate students an opportunity to develop an interdisciplinary specialization in environmental policy. See Economics for program description.
strategic management. Understanding evolution of thought and emergence of distinct paradigms.

Management Science
(College of Business Administration)

MAJORS DEGREES
Management Science ............... M.S., Ph.D.
Kenneth C. Gilbert, Chairperson

Committee:
Bowers, Melissa R., Management
Bozdogan, Hamparsum, Statistics
Edirisinghe, Chanaka P., Management
Fowler, Oscar S., Management
Gilbert, Kenneth C., Management
Leitnaker, Mary G., Statistics
Noon, Charles E., Management
Ralston, Bruce A., Geography
Srinivasan, Mandyam M., Management

THE MASTER’S PROGRAM
The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program’s flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area.

Supporting areas are available in other departments of the College of Business Administration as well as in computer science, public administration, geography, health, and other areas, subject to approval by the Management Science Committee.

Admission Requirements
The master’s program requires three applicant recommendation forms and the GRE or GMAT. Applications are encouraged from all majors, but a mathematics background equivalent to the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in four semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree program in Management Science on a part-time basis.

Core Requirements Hours
Management Science 531, 532, 533, 534, and 691 or 692 16
Statistics 563
Applied specialization area (approved by advisor) 9
Technical elective: 6
Statistics (500 level or above as approved by advisor)

Mathematics (400 level or above as approved by advisor)
Industrial Engineering (400 level or above as approved by advisor)
Other elective (as approved by advisor)
Electives selected from mathematics, statistics, computer science, business administration, and management science, industrial engineering, or other approved area
Total 40

A thesis option is available to qualified students. 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. The total course load will remain 40 hours for all students.

THE DOCTORAL PROGRAM
The Ph.D. program in Management Science is designed to prepare students for research related to the application of mathematical tools to complex decision making. Three primary objectives of the program are:
1. to provide, through management science coursework, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;
2. to provide sufficient advanced study in a supporting area to qualify the graduate for a joint faculty position in the supporting area and management science. The candidate may choose from the business functional areas (accounting, finance, marketing, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
3. to develop in the student, through coursework in mathematics, statistics and computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements
The doctoral program requires three applicant recommendation forms and the GRE or GMAT, in addition to the Graduate Council’s requirements.

Coursework
A minimum of 48 semester hours of coursework taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be coursework from a master’s program although a master’s is not a prerequisite for the doctorate. The candidate must complete a minimum of 24 semester hours at The University of Tennessee, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program.

The program includes approximately 16 to 20 semester hours of coursework in the applied area.

Qualifying Examinations
The student must demonstrate mastery of probability theory and statistical inference, Statistics 563, 564, by passing a written qualifying examination.

Mastery of 12 to 14 semester hours in mathematics coursework must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement.

Comprehensive Examination
Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation
The student must complete 24 semester hours of Management Science 600: Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted after the dissertation and such other segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 48 hours of coursework, normally is completed in the third year of the program.

ACADEMIC STANDARDS
A graduate student in the College of Business Administration whose grade-point average falls below 3.0 will be placed on probation. A student on probation will be dropped from the program unless his/her cumulative 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.

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

GRADUATE COURSES

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

526 Advanced Applications of Systems Modeling and Simulation (3) (Same as Industrial Engineering 526.)

531 Mathematical Programming (3) Linear programming solution procedures, duality, sensitivity, and parametric analysis, linear-fractional, piecewise-linear, separable and integer programming, transportation linear programs. Prereq: Fundamentals of matrix algebra. (Same as Industrial Engineering 523.)

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

533 Computational Mathematical Programming (3) Computational aspects of mathematical programming models, in particular for large systems. Prereq: 531 and proficiency in computer language.

534 Management Science Methods in Business (3) Application of methods from 531, 532, and 533 to real world problems in business/industry.

551 Leveraging Information Through Descriptive and Prescriptive Modeling (3) Concepts and tools for emulating business operations (descriptive modeling) and for determining optimal operational or tactical strategies (prescriptive modeling). Visualization, optimization, and simulation concepts reinforced through hands-on experience with technologies: geographic information systems (GIS), spreadsheet-based models, simulation packages, and supply chain optimization software. (Same as Information Management 522.)

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

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

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

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

651 Nonlinear Optimization (3) Kuhn-Tucker theory in nonlinear programming, solution procedures for constrained and unconstrained nonlinear programs, search techniques, quadratic programming, duality and sensitivity analysis. Prereq: 531 or equivalent, proficiency in computer language. (Same as Industrial Engineering 602.)

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

691-92 Management Science Seminar (1,1) Subjects selected from current literature. S/NC only.

Robert B. Woodruff, Head

Professors:
Barnaby, D. J., Ph.D. ................. Purdue
Cadotte, E. R., Ph.D. ................. Ohio State
Davis, F. W., Jr., Ph.D. .............. Michigan State
Dicer, G. N., DBA .................... Indiana
Mentzer, J. T. (Harry J. Bruce Chair of Excellence), Ph.D. .... Michigan State
Schumann, D. W., Ph.D. .......... Missouri
Woodruff, R. B. (Liaison) (Prollitt's Prot.), DBA ........................... Indiana

Associate Professors:
Dabholkar, P. A., Ph.D. ............... Georgia State
Foggin, J. H., DBA .................... Indiana
Gardial, S. F., Ph.D. ................ Tennessee
Holcomb, M. C., Ph.D. .............. North Carolina
Moon, M. A., Ph.D. ................. Cornell
Rentz, J. O., Ph.D. .................... Georgia
Rinhart, L. M., Ph.D. ............... Tennessee

Assistant Professors:
Flint, D. J., Ph.D. ..................... Tennessee
Kahn, K. B., Ph.D. ................. Virginia Tech
Myers, M. B., Ph.D. ............... Michigan State
Ruzicka, M. E., Ph.D. .............. Arizona State

549 Logistics and Supply Chain Analytical Techniques (3) Application of various methods and models for analyzing supply chain processes. Understanding, defining, and articulating business and process requirements; development of potential solutions to enterprise issues commonly faced by managers, consultants, and project analysts. Prereq: 510 and Business Administration 511, 512, 513, and 514. (Same as Information Management 521.)

593 Independent Study (3-6) Directed research and study. Prereq: Consent of instructor. May be repeated.

599 Special Topics in Logistics and Transportation (3-6) Seminar designed to study specific current problem areas in logistics and transportation. Topic announced prior to offering. Prereq: Consent of instructor. May be repeated.

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

611 Seminar in Theoretical Foundations (3) (Same as Marketing 611.)

612 Research Methods I (3) (Same as Marketing 612.)

614 Seminar in Evolution of Logistics Thought (3) Survey of concepts, frameworks, theory, research issues, and empirical research in content areas related to logistics and supply chain management. Conceptual foundations, issue controversies, and future directions.

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

693 Independent Study (1-6) Directed research on subject of mutual interest to student and faculty. May be repeated. Prereq: Consent of instructor.

Marketing

GRADUATE COURSES

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

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.

520 Marketing and Customer Value (3) Frameworks, techniques, and processes required for customer relationship management and demand planning in organizations. Twin problems of analyzing markets and customers and translating these analyses into actionable marketing strategies. Prereq: Business Administration 511, 512, and 513 or consent of instructor.

530 MBA Marketing Concentration (6) Product management: Complex, interdisciplinary nature of product development and product management. Strategic issues during product life cycle, from idea conception to product development to commercialization to eventual product dismissal. Integrated communications: Strategies and tactics associated with communicating value to customers. One-to-one marketing approaches, role of personal selling in communication mix, and advertising and promotions management. Global marketing management: Cross-national forces that enable firms to design and maintain competitive marketing and supply chain networks across multiple geographic locations. Prereq: 520 and Business Administration 511, 512, 513, and 514.

593 Independent Study (3) (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.

599 Special Topics Seminar (3) Topics vary: market forecasting, market segmentation, services marketing, marketing channels, and related issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) P/ NP only. E
Assistant Professors:
Choo, Hahn, Ph.D. ............................... Illinois IT
Kit, Kevin, Ph.D. .............................. Delaware
Rack, Philip D., Ph.D. ........................ Florida
Ravon, Claudia J., Ph.D. ........................ Arizona

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Materials Science and Engineering or Polymer Engineering. Both the Materials Science and Engineering and Polymer Engineering programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs.

Areas of concentration within the Materials Science and Engineering degree program include metallurgy, polymers, and materials. Specializations include, but are not limited to: ceramics; composites; electronic materials; physical materials processing; welding metallurgy and materials joining; corrosion science and engineering; biomedical materials; and mechanical and physical behaviors of materials.

Areas of concentration within the Polymer Engineering degree program include rheology and polymer processing; polymer morphology; mechanical, physical and chemical behavior of polymers; and composite materials.

THE MASTER'S PROGRAM

Thesis Option
A total of 30 semester hours is required for the M.S. degree in either Materials Science and Engineering or Polymer Engineering. Additional requirements include:
1. A major consisting of 12 semester hours of graduate courses in materials science and engineering or polymer engineering.
2. Additional courses up to 12 hours total in related areas.
4. Satisfactory performance on a comprehensive oral examination administered by the faculty committee.

Non-Thesis Option
Any candidate may apply for a non-thesis option. Upon acceptance, a supervisory committee of three will be appointed. At least two members of the committee will be from the faculty in the major area, either materials science and engineering or polymer engineering. The requirements for completion of the non-thesis option are as follows:
1. Completion of a total of 30 hours of graduate coursework. At least 18 of those hours must be in the department, and up to 12 hours may be in related areas. Three hours of M$E$ 503 or 504, Seminar, graded Satisfactory/No Credit, may be counted toward degree requirements. The materials science and engineering major and the polymer engineering major must include the same courses required for the thesis option. The candidate's degree program must be approved by the faculty committee.
2. Satisfactory completion of a culminating experience such as M$E$ 580 (Critical Review).
3. Satisfactory performance on a comprehensive examination administered by the faculty committee.

THE DOCTORAL PROGRAM

After one year in residence and with the approval of the faculty, a student may proceed directly to the doctoral program without completion of a master's degree. Departmental requirements for completion of the doctoral degree are as follows:
1. For students proceeding directly to the Ph.D. from the baccalaureate degree: 48 graduate course credit hours with at least six hours of 600-level courses. Six hours of M$E$ 503 or 504, Seminar, graded Satisfactory/No Credit, may be counted toward degree requirements. At least 12 credit hours must be courses taught in the department.
2. Materials science and engineering major and the polymer engineering major must include the courses required for the master's program.
3. Satisfactory performance on a comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 503 or 504 every semester offered.

GRADUATE COURSES

405 Structural Characterization of Materials (4) X-ray diffraction and fluorescence; scanning and transmission electron microscopy; microanalytical techniques.
421 Mechanical Behavior of Materials II (3) Description of stress and strain; linear elastic constitutive equations, isotropic and anisotropic modules in various materials; yield criteria; brittle fracture; crazing; plastic strain constitutive equations, forming operations and
422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metallurgical processing. Ferrus and nonferrous pyrometallurgical refining, slagmetal extraction, solidification, gas-metal processing. Prereq: 303.

429 Introduction to Ceramic Matrix Composites (3) Characteristics of composites: ceramic matrix composites; macromechanics and materials design; overview of fabrication techniques; fiber reinforced ceramics, polycrystalline ceramics, and composites; selection and design considerations. Prereq: Chemical Engineering 484, Ceramic Engineering 484, Industrial Engineering 484, and Mechanical Engineering 484.

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

502 Registration for Use of Facilities (1-15) Required for all students registered in the department of Chemical Engineering. Prereq: any semester when student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

503 Graduate Seminar in Materials Science and Engineering (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

504 Graduate Seminar in Polymer Engineering (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

505 Engineering Analysis (3) (Same as Chemical Engineering 505.)

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

511 Fundamentals of Materials Science and Engineering I (3) Physical properties: electrical and thermal conductivity; elementary quantum physics; band theory, dielectric materials, magnetic and optical properties. Mechanical behavior: stress and strain at a point, elastic and viscoelastic constitutive equations, phenomenological bulk behavior, and deformation mechanisms.


522 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 421 or consent of instructor.

523 Plastic Deformation of Metals (3) Geometry and mechanics of single crystal plastic deformation; slip, twinning, and cleavage, work hardening, effect of temperature, loading rate effects; effect of ordering and solid solution alloying; polycrystalline behavior in terms of single crystal deformation mechanisms; texture formation. Prereq: 501, 320 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems. Prereq: 570 or equivalent.

525-26 Welding Metallurgy (3,3) Welding processes: physical metallurgy of welding, phase transformations; heat flow, residual stresses; theories of hot cracking, cold cracking and porosity formation; applications to process utilization.

528 Ceramic Matrix Composites: Material and Mechanical Properties (3) (Same as Engineering Science 528.)

531 Advanced Corrosion (3) Analysis of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: 470 or consent of instructor.


540 Basic Polymer Chemistry (3) Synthesis, reactions and degradation of polymers. Molecular characterization: solution techniques, microscopy, spectroscopy. Prereq: Semester of organic chemistry and thermodynamics or equivalent.

541 Polymer Rheology (3) Deformation and flow of polymeric materials. Development of empirical models; linear viscoelasticity and strain rate and time; phase transformations; molecular motions. Prereq: 541.

542 Further Topics in Polymer Processing (3) Application of theories of rheological behavior and of constitutive equations for describing deformation and flow of polymeric materials. Prereq: Polymer Science and Engineering 360 or equivalent.


546 Mechanical Properties of Solid Polymers (3) Types of mechanical behavior; Hook’s law and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; creep and stress relaxation; indentation; and introduction to mechanical properties of polymeric composites.

549-50 Laboratory Methods in Polymer Engineering (1, 2) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, rheometry, mechanical properties of solid polymers, polymer processing operations. Coreq: 540 or consent of instructor. 549: S/NC only. 550: S/NC only.

560 Principles of Ceramic Processing (3) Treatment of ceramic processing; raw materials preparation and characterization; powder consolidation; drying; firing, sintering techniques, mechanisms and kinetics. Prereq: 360 or equivalent.

571 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 405 or equivalent.

572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of ceramics. Prereq: Profit to inorganic, metallic and polymer structures.

576 Special Topics in Materials Science and Engineering (3) Topics of current significance and interest. Prereq: Consent of instructor. May be repeated.


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

621-22 Theoretical Metallurgy (3,3) Topics in solid state physics as applied to metallurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation. Prereq: Consent of instructor.

623 Solidification and Crystal Growth (3) Theories of solidification, fluid flow effects, magnetohydrodynamics of incompressible fluids, growth stabilization, thermodynamics of nucleation, rapid solidification, metastability. Prereq: Consent of instructor.

625 Materials Lifetime Science and Engineering I (3) Fundamentals of aqueous and high-temperature corrosion and fatigue; methods of materials lifetime modeling. Prereq: 531 and 532, or consent of instructor.

626 Materials Lifetime Science and Engineering II (3) Interactions between corrosion and fatigue at ambient and high temperatures; lifetime modeling of materials simultaneously subjected to corrosion and fatigue. Prereq: 625.

627 Case Studies in Materials Lifetime Science and Engineering (3) Studies of, and participation in, industrial analyses of lifetimes of structural materials subjected to aqueous-corrosive, high-temperature oxidation, and high-temperature-accelerated tests. Prereq: 531 and 532, or consent of instructor.

628 Graduate Seminar in Materials Lifetime Science and Engineering (1) Seminars by students, faculty, and visiting scholars on materials lifetime science and engineering; processes, mechanisms, and materials lifetime modeling. Prereq: 531 and 532, or consent of instructor. S/NC only.

641 Advanced Rheology and Viscoelastic Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing deformation and flow of polymeric materials. Application to polymer processing problems. Recommended for MS candidates working in polymer processing. Prereq: Consent of instructor.

642 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and structure development to analysis of polymer processing operations. Prereq: 541. (Same as Chemical Engineering 650.)

643 Phase Transformations in Polymers (3) Glass transition and glassy state; annealing of polymeric glasses; crystalization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification of copolymers; crystallization under stress. Prereq: 543.

671 Quantitative Microscopy (3) Principal acoustic, optical, x-ray, neutron and electron and field-ion techniques for examination of microstructures of materials. Prereq: 405.
Mathematics (College of Arts and Sciences)

MAJOR DEGREES
Mathematics ...................... M.M., M.S., Ph.D.

Professors:

Alexiades, V., Ph.D. .............. Delaware
Anderson, D. F., Ph.D. .......... Chicago
Bradley, John S. (Emeritus), Ph.D. ....... Iowa
Carruth, J. H. (Emeritus), Ph.D. ........... Louisiana State
Clark, C. E. (Emeritus), Ph.D. ....Louisiana State
Conway, J. B., Ph.D. .......... North Carolina
Daverman, Robert J., Ph.D. .......... Wisconsin
Dobbs, D. E., Ph.D. ............ Cornell
Dyak, J., Ph.D........................... Warsaw
Frandsen, Henry (Emeritus), Ph.D. .... Illinois
Gross, L. J., Ph.D. ................... Cornell
Hinton, D. B., Ph.D. ............... Tennessee
Husch, L. S. (Emeritus), Ph.D. .... Florida State
Johannson, K., Ph.D. .............. Bielefeld
Jordan, G. Samuel, Ph.D. ......... Wisconsin
Karakashian, O., Ph.D. .......... Harvard
Kupermidt, B. A. (UTSI), Ph.D. ....... MT
Lenhart, S., Ph.D. ....................... Kentucky
McConnel, R. M. (Emeritus), Ph.D. ...... Duke
Mathews, H. T. (Emeritus), Ph.D. .... Tulane
Miller, D. E. (Emeritus), Ph.D. ........ Michigan
Mualy, S., Ph.D. ................... Purdue
Plaut, Conrad, Ph.D. .......... Maryland
Rajput, B. S., Ph.D. ............... Illinois
Reddy, K. C. (UTSI), Ph.D. .......... Indian IT
Richter, Stefan, Ph.D. .......... Michigan
Rosinski, J., Ph.D. .............. Wroclaw
Schafer, P. W., Ph.D. .......... Maryland
Serbin, Steve (Emeritus), Ph.D. ........ Cornell
Simpson, H., Ph.D. ................ Cal Tech
Soni, K. (Emeritus), Ph.D. ........ Oregon State
Soni, R. P., Ph.D. .............. Oregon State
Stallman, F. W. (Emeritus), Ph.D. .... Giessen
Stephenson, K. R., Ph.D. ........ Wisconsin
Sundberg, C., Ph.D. .............. Wisconsin
Thistletwaite, M. B., Ph.D. ....... Manchester
Wade, W. R., Ph.D. ......... California (Riverside)
Wagner, C. G., Ph.D. ............ Duke

Associate Professors:

Collins, Charles R., Ph.D. .... Minnesota
Feng, Xiaobing, Ph.D. .......... Purdue
Freire, A., Ph.D. .................. Princeton
Gavrilits, Sergey, Ph.D. ...... Moscow State
Guan, Bo, Ph.D. ............... Massachusetts
Kimble, K. R. (UTSI), Ph.D. ....... Ohio State
Kuo, Y., Ph.D. ................... Cincinnati
Xiong, Jie, Ph.D. ................ North Carolina

Assistant Professors:

Chen, Xia, Ph.D. .................. Case Western

Mathematics 145

676 Advanced Topics in Materials Science and Engineering (3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

678 Seminar in Recent Advances in Materials Science and Engineering (3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.

The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers, (2) the Master of Science degree, designed to prepare students for industrial employment and for teaching, and (3) the Doctor of Philosophy degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

A student offering mathematics as a minor for the master’s degree is required to obtain at least 6 hours of resident graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

For additional information, please visit the graduate website on the Department of Mathematics' homepage at www.math.utk.edu.

THE MASTER OF MATHEMATICS PROGRAM

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

The following requirements must be met:

1. Complete 30 hours of coursework of which 21 must be at the 500 level. The coursework must include 504, 505, 506, 507, and 6 hours in 509. At most, 6 hours may be taken outside the Department of Mathematics (selected in consultation with the advisor).

2. Pass a final examination upon completion of all coursework.

In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with coursework. Normally Master of Mathematics degree students will start the program by taking 504 during the summer.

THE MASTER OF SCIENCE PROGRAM

The department offers two options for the Master of Science degree. The first option requires a thesis for which 6 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 may be in an area outside the department and 15 must be in courses in mathematics numbered above 500.

After one semester of graduate study, a student whose advisory committee gives its approval may choose the non-thesis option, for which 30 hours in courses numbered above 400 are required. Of these, 21 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, 9 in courses approved by the advisory committee may be taken in fields other than mathematics. For this option it is also required that a written final examination be passed and that credit be received for a reading course (598) in which a term paper or project is required.

Concentration in Applied Mathematics

For this concentration, available under the thesis or the non-thesis option, the student must complete the following:

1. Prerequisite courses:
   d. Matrix Algebra II 453.

2. One hour of Seminar in Applied Mathematics 519 or Seminar in Mathematical Ecology 589.

3. One course from each of the following five areas:
   e. Statistics - Statistics 525, Stochastic Modeling 527, Statistical Methods 571 (Statistics), Biometry 560 (Ecology and Evolutionary Biology).

THE DOCTORAL PROGRAM

For the Ph.D. program in Mathematics, the student must meet the following four requirements in addition to those of the Graduate Council:

1. Satisfy either the standard program or the interdisciplinary mathematical ecology concentration. A student intending to work in mathematical ecology may complete either but is encouraged to complete the interdisciplinary mathematical ecology concentration. A student may elect to switch from one to the other provided the constraints of the latter option have not been violated. A student's status after electing such transfer is determined by the complete history of the student's earlier mathematics examinations from the standard program and the interdisciplinary mathematical ecology concentration. Descriptions of both programs are given below.

2. Demonstrate proficiency in one foreign language, normally French, German or Russian. This requirement must be met prior to the examination in the area of specialization. A student's doctoral committee may require the student to pass a second language examination.
3. Pass an examination in the field of specialization. After the requirements in 1. and 2. have been met, this examination will be given by a committee appointed by the department head. A student may take this specialty examination only twice.

d. At any one time a student may take at most two examinations in the courses associated with two additional subjects. The three subjects selected for written examinations must be from Groups I, II, and III. At least two groups must be represented in the three written examinations. At least three groups must be represented in the five subjects.


A student’s five subjects may not include both both Real Analysis and Applied Linear Analysis or both Mathematical Principles of Fluid Mechanics and Mathematical Principles of Continuum Mechanics. A student may not count examinations in these subjects from the groups listed in the standard program. This requirement may not be satisfied with courses from outside the department. At least one of the subjects used to meet this requirement or the written examination subject in 1. must be from Group I or II.

A student must earn grades of B+ or better each semester in the courses associated with these subjects. At least one of the subjects must be from a group other than the one from which the student has taken the examination. The examination in this subject may be taken only twice.

The student also must earn grades of B+ or better each semester in the courses associated with these subjects. The examination in this subject may be taken only twice.

A student may take as many written examinations as desired at any time the examinations are given, subject to the following conditions:

a. The examination to be taken must be approved in advance by the student’s advisory committee.

b. At any one time a student may take at most the number of examinations necessary to meet the one subject requirements.

c. A student may take a collection of written examinations a maximum of three times, but no one failing 4 examinations, counting possible repetitions, will be permitted to take another examination. An exception is that a student who does not have a master’s degree in mathematics and who has been enrolled in a UT graduate program in mathematics no longer than one year may take written examinations at one time during that year without having that sitting for the examinations or any incurred failure(s) count toward the limits imposed above.

d. At least two examinations must be taken at least one must be passed before the start of the student’s fourth year. Three examinations must be passed before the start of a student’s fifth year.

*In lieu of earning a grade of B+ or better each semester in a sequence from Group I, II or III, a student may demonstrate proficiency in that subject by passing the associated written examination. For this purpose, only one examination in each of 2 or 3 subjects, and this use of a written examination must be declared before the examination is taken so that the sitting for the examination and any failure are not counted toward the limits in condition c.

Mathematical Ecology Concentration

The student must pass written examinations in three subjects:


2. A subject from Groups I, II, and III of the standard program.

3. A subject represented by a year-long graduate-level sequence from outside the Department of Mathematics. The sequence must be approved in advance by the mathematical ecology faculty and by the departmental Graduate Committee. At least one member of the mathematical ecology faculty must be involved in the grading of the examination. The examination in this subject may be taken only twice.

The student also must earn grades of B+ or better each semester in the courses associated with these subjects. At least one of the subjects used to meet this requirement or the written examination subject in 1. must be from Group I or II.

Except for the privilege of utilizing as a Group IV course a course from outside the department, this concentration is subject to the constraints and privileges specified in the standard program, including the restrictions on related subjects, the conditions a. through d. of Table 1, the requirement of taking additional examinations, and the option to pass a written examination in lieu of earning a grade of B+ or better each semester in a sequence from Group I, II or III.

GRADUATE COURSES

400 History of Mathematics (3) Development of major ideas in mathematics to modern times and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course: at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Matrix Algebra I, Introduction to Abstract Mathematics.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts and problems in mathematics. Does not satisfy the major requirements for a B.S. or M.S. in mathematics. Prereq: Calculus I.

403 Mathematical Methods for Engineers and Scientists (3) Matrix computations, numerical methods, partial differential equations, Sturm-Liouville Theory, and special functions used in engineering and science. Does not satisfy major requirements for a B.S. or M.S. in mathematics. Prereq: Calculus I. 214 Calculus II, 241 Calculus III, and familiarity with operating system and programming language.

404 Applied Vector Calculus (3) Topics from multi-variable and vector calculus; line and surface integrals, divergence theorem and theorems of Gauss and Stokes. Prereq: Calculus III.

405 Models in Biology (3) Difference and differential equation models of biological systems. May not be counted toward graduate degree. Prereq: Calculus II or Biocalculus II.


421 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures: sequences, partitions, graphs, finite fields and geometries, or experimental designs. Prereq: Probability and Statistics or consent of instructor.

423 Probability I (3) Axiom probability, multi-variable distributions, conditional probability and expectation, methods of moment generating/characteristic functions. Laws of large numbers and central limit theorem. Prereq: 300-level probability or consent of instructor.

424 Probability II (3) Elements of stochastic processes: Random walk, Markov chains and Poisson processes. Other topics as selected by instructor. Prereq: 423.

425 Statistics (3) Derivation of standard statistical distributions; t, F and χ2; independence of sample mean and variance, Moment generating function; point and interval estimation, Bayesian estimates; statistical hypotheses, Neyman-Pearson theorem; likelihood ratio and other parametric and non-parametric tests; sufficient statistics. Prereq: Probability and Statistics; consent of instructor.


443 Complex Variables I (3) Theory of functions of complex variable: residue theory and contour integrals. Prereq: Calculus III. Recommended prereq: 300- or 400-level mathematics course.

445-46 Advanced Calculus I, II (3,3) Theory of sequences and series, differential and integral functions of functions of one or more variables. Prereq: Calculus III and Introduction to Abstract Mathematics, or consent of instructor.


453 Matrix Algebra II (3) Matrix theory including Jordan canonical form. Prereq: Matrix Algebra I.

455-56 Abstract Algebra I,II (3,3) Algebraic structures: groups, rings, fields, vector spaces and linear transformations. Prereq: Matrix Algebra I and Introduction to Abstract Mathematics, or consent of instructor.


460 Geometry (3) Axiomatic and historical development of Euclidean, hyperbolic, and non-Euclidean geometries stressing proof technique and critical reasoning. Models of Non-Euclidean geometries. Prereq: Introduction to Abstract Mathematics, or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties, compact sets, connected sets, continuous functions, homeomorphisms, and topological invariants. Prereq: Calculus III and Introduction to Abstract Mathematics, or consent of instructor.

471 Numerical Analysis (3) Computation, instabilities, and rounding, Interpolation and approximation by polynomials and piecewise polynomials. Quadrature and numerical solution of initial and boundary value problems of ordinary differential equations, stiff sys-

475 Industrial Mathematics (3) Modeling, analysis, and computer simulation applied to scientific/technical/industrial problems. Prereq: Differential Equations I and either Computer Literacy for Mathematics or Numerical Algorithms, or consent of instructor.

490 Readings in Mathematics (1-3) Open to superior students who have had Departmental Hon. Indep. 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 (1-15) Required for students with 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 Discrete Mathematics for Teachers (3) Mathematical logic and methods of argument, sets, functions and relations, combinatorics. Normally first graduate course toward M.S. degree. Prereq: 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.

506 Algebra for Teachers (3) Algebraic structures: integral domains and fields and their applications to algebra, polynomial functions, radicals. Prereq: 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. Prereq: 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) Fundamental and techniques associated with discrete and continuous models of physical, engineering and biological systems: difference equations, networks and graphs, optimization, time series analysis, qualitative analysis, delay-differential equations, and other topics. Coreq: 510. Prereq or coreq: 445 or 447, and 453.

514 Mathematical Principles of Fluid Mechanics (3.3) Equations of motion, compressible and incompressible flows, boundary layers, Navier-Stokes equations, Prereq: 431, 435, and 445-46 or 404, or consent of instructor.

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, instability and bifurcation, distributions, integral equations, Prereq: 446 or 448, 453, and either 511-12 or both 431 and 435.

517-18 Mathematical Methods in Physics (3.3) (Same as Physics 571-72.)

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

521-22 Enumerative Combinatorics (3.3) Sieve methods, recursion, exponential generating functions, and permutation groups are applied to enumeration of discrete structures, incidence algebras and combinatorics of partially ordered sets.

523-24 Probability (3.3) Pertinent facts from measure theory, Kolmogorov’s existence theorem, series of independent random variables and laws of large numbers; general theory of distributions of random variables and their characteristic functions; weak convergence concept, weak compactness and Levy’s continuity theorem in Euclidean spaces; infinitely divisible distributions. Prereq: 445-46. (Same as Computer Science 471.)

525-26 Statistics (3.3) Pertinent facts from probability theory, formulation of statistical models; sufficiency, Neyman-Pearson lemma, uniformly most powerful tests; general linear models, estimation and tests in linear models; non-parametric models, rank methods for comparison, linear independence and the Hessian matrix; functional and linear regression; linear and least square tests; topics from decision theory. Prereq: 445-46. Recommended prereq: 423.

527 Stochastic Modeling (3) Models in probability applied to real world situations; queueing theory; branch- ing 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 necessary conditions, conjugate points, Jacobi’s conditions, The Mayer problem, Legendre’s condition, Jacobi’s condition, conjugate points, multiple integrals. Prereq. 431.

535-36 Partial Differential Equations (3.3) First order equations, classification of equations and properties of wave, heat, Laplace equations, hyperbolic, and parabolic equations in several variables. Prereq: 445-46 and 231 or consent of instructor.


539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


547-48 Applied Linear Analysis (3.3) Banach and Hilbert spaces, linear operators and spectral theory with applications to integral and differential equations, optimization, numerical analysis, and quantum mechanics, Sobolev spaces and embedding theorems. Prereq: 445-46.

549 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

551-52 Modern Algebra (3.3) Groups, rings, modules and linear algebra, fields and Galois theory. Must be taken in sequence. Prereq: 455-56 or consent of instructor.

553 Linear Programming (3) Theory and applica- tions. Prereq: Consent of instructor or 453 and pro- gramming ability.


555-56 Number Theory (3.3) Introduction to algebraic number theory. Prereq: 455-56 or consent of instructor.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

561-62 Topology (3.3) Topological spaces; metriz- ation; homeomorphic invariants of point sets. Mappings and homotopies. Covering spaces and fundamental group.

567-68 Differential Geometry (3.3) Classical differential geometry in two and higher dimensions: curves and surfaces in Euclidean space, Gauss map, curva- ture, Gaus-Bonet formula, hyperbolic geometry, Manifolds and Riemannian metrics; connections, geodesics, Jacobi fields, sectional curvature. Differential forms and curvatures frames. Prereq: 445-46 or consent of instructor.

569 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.


575 Matrix Theory and Techniques in Numerical Analysis (3) Advanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern com- puter architectures. Prereq: 453, 471-72, or consent of instructor. May be repeated. Maximum 9 hrs. (Same as Computer Science 575.)


578 Numerical Methods for Partial Differential Equations (3) Advanced topics in study of numerical solution of partial differential equations including conservation laws and hyperbolic, parabolic, and elliptic problems. Derivation, physical meaning, and implementation of schemes. Prereq: 435 or 512 or 515, Fortran or C, or consent of instructor.

579 Seminar in Numerical Mathematics (1-3) May be repeated. Maximum 12 hrs.
581-82 Mathematical Ecology (3,3) Deterministic and stochastic models of populations, communities, and ecosystems. Prereq: 431, 453 or consent of instructor. (Same as Ecology and Evolutionary Biology 581-82.)

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary ecology. Prereq: 431, 453 or consent of instructor. (Same as Ecology and Evolutionary Biology 585.)

585 Optimal Control Theory (3) Deterministic optimal control. Examples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. Prereq: 431, 445-46 or consent of instructor.

589 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

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

598 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) Prerequisite only. E


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

623-24 Advanced Probability (3,3) Selected topics in modern theory of probability and stochastic processes: Itô’s calculus and stochastic differential equations, integration and measure theory, ergodic theory, probability on algebraic structures, limit theorems, geometry and probability in Banach spaces, probability methods in analysis. Prereq: 523-24 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

629 Seminar in Combinatorics (1-3) May be repeated with consent of department. Maximum 12 hrs.

631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced viewpoint. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq: 531-32 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


641-42 Functional Analysis (3,3) Topological vector spaces, distributions, and Banach algebras with applications to Fourier analysis and applications of Banach spaces, probability theory, analysis on Hilbert spaces, Fourier transforms on Euclidean spaces or topological groups: convergence, summability, uniqueness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-Littlewood maximal function, interpolation of operators, or a Fefferman-Stein duality. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

643-44 Harmonic Analysis (3,3) Fourier series and Fourier transforms on Euclidean spaces or topological groups: convergence, summability, uniqueness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-Littlewood maximal function, interpolation of operators, or a Fefferman-Stein duality. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 551-52 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

659 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


667-68 Advanced Differential Geometry (3,3) Selected topics from Riemannian geometry and analysis on manifolds: Lie groups, metric geometry, spectrum of Laplacian, Hodge Theory, variational problems, curvature and topology of manifolds. Prereq: 567-68 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

669 Seminar in Topology (3) May be repeated with consent of department. Maximum 12 hrs.


679 Seminar in Numerical Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

681-82 Advanced Mathematical Ecology (3,3) Selected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied topics such as demography, ecotoxicology, epidemiology, environmental change, and resource management. Prereq: 581-82. May be repeated. (Same as Ecology and Evolutionary Biology 681-682.)

## Mechanical, Aerospace and Biomedical Engineering

### (College of Engineering)

#### MAJOR

| DEGREES |
|-----------------|------------------|------------------|
| Aerospace Engineering | M.S., Ph.D. |
| Engineering Science | M.S., Ph.D. |
| Mechanical Engineering | M.S., Ph.D. |

**T. E. Shannon, Interim Head**

**Professors:**

- Antar, B. (UTSI), Ph.D. ........................ Texas
- Armillii, R. V., Ph.D. ......................... VPI

**Assistant Professors:**

- Baker, A. J., Ph.D. ......................... New York
- Carley, T. G. (Emeritus), Ph.D. ........... Illinois
- Caruthers, J. E. (UTSI), Ph.D. .......... Georgia Tech
- Collins, F. G. (UTSI), Ph.D. ............ California
- Crawford, R. A. (Emeritus) (UTSI), Ph.D. ........................ Tennessee

**Associate Professors:**

- Dareing, D. W., P.E., Ph.D. ............... Illinois
- Edmondson, A. J. (Emeritus), Ph.D. ...... Texas &M
- Engels, R. C. (UTSI), Ph.D. ............... VPI
- Flandro, G. W. (UTSI), Ph.D. ............ Cal Tech
- Forrester, J. H. (Emeritus), Ph.D. ......... Iowa State

**Emeritus Professors:**

- Fortey, J. W. (Emeritus), Ph.D. ......... Pennsylvania
- Forrester, J. H. (Emeritus), PE, Ph.D. ........................ Pennsylvania
- Forrester, J. H. (Emeritus), Ph.D. ......... Missouri State
- Fortey, J. W. (Emeritus), Ph.D. ......... Pennsylvania
- Forrester, J. H. (Emeritus), Ph.D. ......... Missouri State
- Fortey, J. W. (Emeritus), Ph.D. ......... Pennsylvania
- Forrester, J. H. (Emeritus), Ph.D. ......... Missouri State
Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are available with majors in Mechanical Engineering, Aerospace Engineering, and Engineering Science. Changing from one of these programs to another requires departmental approval. Each applicant is advised to consult with the program's major professor before entering a program. A dual M.S.-MBA degree program with a concentration in product development and manufacturing is also available with a major in Mechanical Engineering or in Engineering Science. In Mechanical Engineering, program concentrations include dynamics, control, and robotics; energy conversion and utilization; gas dynamics; heat transfer and fluid mechanics; machine design; power generation; product development and manufacturing (MS only); propulsion; space engineering; stress analysis; and thermodynamics.

In Aerospace Engineering, program concentrations include aeroacoustics; aerodynamics and performance; energy conversion and utilization; flight and aerospace mechanics; gas dynamics; heat transfer and fluid mechanics; propulsion; space engineering; structures and stress analysis; and thermodynamics.

In Engineering Science, program concentrations include applied artificial intelligence, biomedical engineering, computational mechanics, fluid mechanics, mechanics of composite materials, solid mechanics, industrial engineering (Ph.D. only), product development and manufacturing (MS only), optical engineering (UTS only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. The flexibility and interdisciplinary aspect of these programs are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The program's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as biomechanics.

In Mechanical Engineering or Aerospace Engineering, entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. A program application is required in addition to the Graduate Application for Admission. Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in engineering backgrounds. The general GRE is required of all international applicants for admission.

In Engineering Science, entrance into the graduate program is available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. A program application is required in addition to the Graduate Application for Admission. The names and addresses of four references must be included with the program application. The general GRE is required of all international applicants for admission.

Each student must satisfactorily complete a program of study that has been approved by his/her advisory committee and complies with the requirements of the Graduate Council. In Engineering Science, the student's major professor may be selected from a department other than the Department of Mechanical and Aerospace Engineering and Engineering Science; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Mechanical and Aerospace Engineering and Engineering Science.

**THE MASTER'S PROGRAM**

In Mechanical Engineering, Aerospace Engineering, and Engineering Science, two M.S. options are offered. Option I requires a thesis and is the normal program for graduate students. Option II does not require a thesis and provides graduate students, including co-op and other off-campus students, the opportunity to focus their programs in special areas through extended coursework.

Credit requirements for these two options in Mechanical Engineering and Aerospace Engineering are:

<table>
<thead>
<tr>
<th>Course Areas</th>
<th>Hours Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis credit</td>
<td>6 n/a</td>
</tr>
<tr>
<td>Coursework</td>
<td>24 30</td>
</tr>
<tr>
<td>Courses in program</td>
<td>500-level or above</td>
</tr>
<tr>
<td>(400-level or above)</td>
<td>6 6</td>
</tr>
<tr>
<td>590 Selected Engineering Problems (max.)</td>
<td>n/a 6</td>
</tr>
<tr>
<td>Total</td>
<td>30 30</td>
</tr>
</tbody>
</table>

Credit requirements for these two options in Engineering Science are:

<table>
<thead>
<tr>
<th>Course Areas</th>
<th>Hours Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis credit</td>
<td>6 n/a</td>
</tr>
<tr>
<td>Coursework</td>
<td>24 30</td>
</tr>
<tr>
<td>Engineering courses (Major concentration may include but is not restricted to course offered by the Department)</td>
<td>12 15</td>
</tr>
<tr>
<td>Mathematics (400 level or above)</td>
<td>6 6</td>
</tr>
<tr>
<td>Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses)</td>
<td>6 9</td>
</tr>
<tr>
<td>590 Selected Engineering Problems (max.)</td>
<td>n/a 6</td>
</tr>
<tr>
<td>Total</td>
<td>30 30</td>
</tr>
</tbody>
</table>

For all program options, other 500 level engineering courses that are approved by the student's master's committee and the graduate programs committee may be substituted for the mathematics courses. All program options require participation in the departmental graduate seminars program, passing a final examination on all work submitted for the degree. The final examinations in Option II will cover all coursework. The thesis option, Option I, requires submis-

**DUAL M.S.-MBA PROGRAM**

The College of Business Administration and the College of Engineering offer an integrated program leading to the conferment of the Master of Business Administration degree with a major in Business Administration (concentration in operations management) and the Master of Science degree with a major in Engineering Science or Mechanical Engineering (concentration in product development and manufacturing).

The Engineering Science program is intended to provide other engineering majors an opportunity to participate in this program with a flexible coursework plan based on their undergraduate degree.

The establishment of the dual program addresses the critical need for personnel trained in both engineering and management who can integrate an increasingly complex body of knowledge for rapid introduction of new products to the marketplace. The objective of the dual degree program is to prepare graduates to take a leading management role in companies that must react quickly to a dynamic market where forces of competition require rapid changes in design and manufacturing and a short product development cycle.

**Admission Requirements**

Applications are accepted for fall semester only. Applicants for the M.S.-MBA program must make separate application to, and be competitively and independently accepted by, the Office of Graduate Admissions for the Master of Business Administration degree program and the Master of Science degree program with a major in Engineering Science or Mechanical Engineering, and by the Dual Program Committee.

Students will initially apply for the MBA program, indicating on their application the intent to pursue the dual M.S.-MBA program and the appropriate engineering major (refer to the MBA program for separate instructions). Students accepted for both the MBA and the M.S. with a major in Engineering Science or Mechanical Engineering programs will be assigned to Dual Program Committee advisors, who will be responsible for course approval and supervision of the students' progress through the dual program.

Applications by U.S. citizens and permanent residents received after the MBA application deadline (March 1) will be considered as space allows. Additional information is required and different application dates are established by the Office of Graduate Admissions for international students.

**Curriculum**

All engineering students enrolled in the program must complete common coursework designed to provide them with an integrated, multidisciplinary teamwork experience. The MBA curriculum in product development and manufacturing consists of 4.5 hours of common coursework in the College of Business Administration and 15 hours of common coursework in the College of
### Curriculum for Dual M.S.-MBA Degree – Major in Mechanical Engineering

#### August - First Year
- **BA 511** MBA Core I 3
- **ME 504** Product Development Process 1 9

#### Fall - First Year
- **BA 512** MBA Core II 15 9
- **ME 509** Project Management 1 6

#### Spring
- **BA 513** MBA Core III 9 6
- **ME 506** Product Selection and Evaluation 2 12
- **ME 508** Integrated Product, Process, and Manufacturing System Design 3 12

#### Summer
- **BA 514** Integrated Business Simulation 3 9
- **ME 509** Project Management 1 6

#### Fall - Second Year
- **IE 511** Business Planning and Commercialization 3 9
- **ME 509** Project Management 1 6
- **ME 505** Mechatronics 3 12
- **ME 555** Design Tools 5 12

#### Spring
- **BA 514** Internship 3 12
- **ME 509** Project Management 1 6
- **ME 505** Mechatronics 3 12
- **ME 555** Design Tools 5 12

#### Summer (first session)
- **ME 594** Culminating Integrated Project Report 3 12

**TOTAL:** 66 hours

The dual degree candidate must satisfy the curriculum and graduation requirements of the engineering major being pursued and the College of Business Administration. Students withdrawing from the dual degree program before completing both degrees will not receive credit toward graduation in either degree program for courses taken in the other degree program, except as such courses qualify for credit without regard to the dual degree program. The M.S. and the MBA degrees will be awarded upon successful completion of the requirements of the dual program.

#### Approval Dual Credit

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

### THE DOCTORAL PROGRAM

All students must complete a minimum of 72 semester hours beyond the Bachelor’s degree, exclusive of credit for the master’s thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

In Mechanical Engineering or Aerospace Engineering, the courses must include:

1. A minimum of 12 semester hours of graduate credit in mathematics in courses numbered 400 or above with a minimum of 6 semester hours numbered 500 or above.
2. A minimum of 24 semester hours in the department in courses numbered 500 and above, with at least 12 of these semester hours in the major. A minimum of 9 semester hours of courses is required at the 600 level. These are exclusive of thesis, problems, or dissertation credit. The student’s advisory committee can approve a student’s petition to replace one 600-level course with one or more 500-level courses that are more appropriate.

### ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S. program in Aerospace Engineering is available to residents of the states of Kentucky or South Carolina. The Ph.D. program in Aerospace Engineering is available to residents of the states of Arkansas or Kentucky. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

### GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Students majoring in Mechanical Engineering or Aerospace Engineering may not normally use more than one 400-level engineering course to meet their advanced degree requirements. Undergraduate courses that are required for the bachelor’s degree in Mechanical Engineering may not be taken for graduate credit by graduate students in Mechanical Engineering. Undergraduate courses that are required for the bachelor’s degree in Aerospace Engineering may not be taken for graduate credit by graduate students in Aerospace Engineering. For students majoring in Engineering Science, 400-level courses in
Engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of minimum required credit hours in a master’s degree program must be at or above the 500-level. With the approval of the student’s major department, a student whose major is outside the College of Mechanical, Aerospace, and Biomedical Engineering may take senior (400-level) courses in the department for graduate credit. Such students should consult with instructors regarding prerequisites for undergraduate courses.

**Aerospace Engineering**

**NOTE:** Not all the courses listed below are available at both the UT and the UTSC campuses.

**GRADUATE COURSES**

422 Aerodynamics (3) Theory and design of aero-
dynamic bodies for desired characteristics. Potential flow theory, viscous effects, compressibility effects. Subsonic boundary layer theory, supersonic airfoils. Prereq: 351 Compressible Flow, 370 Aerospace Flight, F.


425 Propulsion (3) Principles of propulsion devices: turbo-jet, ram jet and rocket engines. Prereq: 351, F.

426 Introduction to Aerospace Design (2) Design process, synthesis, safety, reliability, patents, product liability, economic analysis, optimization, design standards, design studies. Individual design reports. Prereq: 351, 370, 363. Coreq: Mechanical Engineering 344, F.


449 Aerospace Engineering Laboratory (3) Designing, conducting, and reporting results of experi-
mental exercises. Test standards and specifications. Analysis of data and formation of conclusions. Prereq: 345 Aerospace Engineering Instrumentation and Me-
asurements 351 Compressible Flow, 425, 3 labs. F.

494-95 Selected Topics in Aerospace Engineering (1-4) Topics and problems related to developments and practice in aerospace engineering. Prereq: Con-
sent of instructor. E

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

502 Registration for Use of Facilities (1-15) Re-
quired 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 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids, potential flow about body, conformal mapping. Prereq: 422 or 541, Mathematics 425 or equivalent.

512 Viscous Flow (3) Derivation of fundamental equations of compressible viscous flow; boundary conditions for inviscid flow; exact solutions for Newtonian viscous flow (Navier-Stokes) equations for special cases; similarity solutions. Ther-
mal boundary layers, stability of laminar flow, transition to turbulence, 2-D turbulent boundary layer equations. Incompressible-turbulent mean flow, and compressible boundary layer flow. Prereq: Consent of instructor.

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; representative experiments: hot wire anemometry and
turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser-
optical measurements. Prereq: 423 Viscous Flow or 541.

515-16 Air Vehicle Aerodynamics and Performance (3,3) Application of aerodynamics principles to air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to hyper-
sonic aerospace vehicles: transport, drag, lift, longitudinal, lateral and directional stability, propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 422; 515 for S.

521-22 Aerodynamics of Compressible Fluids (3,3) One-dimensional unsteady, external flow: waves, small perturbation theory; slender body theory; simi-
larly rules; method of characteristics. Prereq: 422 for 521, 521 for 522.

525 Hypersonic Flow (3) slender body flow; simili-
tude; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 512.

527-28 Aerospace Ground Test Facilities (3,3) At-
mospheric models and similarly considerations; aero-
dynamic test facilities: continuous and discrete wind tunnels and ballistic ranges; propulsion test facilities or air breathing and rocket engines; space environment and vehicle test facilities. Prereq: 521, 541 and Mechanical Engineering 522.

529 Rarefied Gasdynamics (3) Binary elastic colli-
sions; kinetic theory; flow regimes; Boltzmann and model equations, transfer equation, gas-surface inter-
actions; slip, boundary layer, free molecule, slip and transition flow; Monte Carlo simulation; experimen-
tal techniques; introduction to hypersonic real gas flows. Prereq: 522, Mechanical Engineering 522.

531 Magnetohydrodynamics (3) Electromagnetic field theory, chemical kinetics; thermodynamic and thermophysical properties of gas plasmas; governing equations and applications. Prereq: 422 and Mathe-

532 Introduction to Turbulence (3) Macroscopic effects of turbulence: turbulent transport, correlation, turbulence functions, energy spectra, diffusion; application of turbulent jets and pipe flow. Prereq: 511-12.

533 Dynamics (3) Same as Mechanical Engineering 533 and Engineering Science 533.

534 Atmospheric Entry (3) Reentry trajectories; lift and drag, and motion of entry vehicle, motion and stability during reentry; aerodynamic heating and heat pro-

535 Mechanical Vibrations (3) Same as Mechanical Engineering 534 and Engineering Science 534.

539 Continuum Mechanics (3) Same as Engineering Science 539 and Mechanical Engineering 539.

541 Fluid Mechanics I (3) Same as Mechanical Engineering 541 and Engineering Science 541.

542 Fluid Mechanics II (3) Same as Mechanical Engineering 542 and Engineering Science 542.

544 Transonic Flow (3) Nature of flow at transonic speeds; small disturbance theory; shock wave prop-
ections; shock-free flows; strong viscous interaction phenomena; similarity techniques. Prereq: 522.

551 Aerospace Mechanics (3) Principles of mech-
anic principles applicable to aerospace vehicles, equations of motion, multibody problems and trajectory analysis. Prereq: Mathematics 471.


554 Aerospace Vehicle Stability and Control (3) Static and dynamic longitudinal directional and lateral stability and control. Coupled modes. Motion with free and fixed flight 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 riper type aircraft. Vertical and transition flight modes. High lift airfoils. Automatic controls. Simulation facility types and flight testing. Prereq: 555.


561 Fundamentals of Aeroacoustics (3) Generation, propagation and absorption of sound in static and moving media. Prereq: Consent of instructor.

564 Spacecraft Attitude Dynamics and Control (3) Rotational attitude to governing equations, gyro-
scopic instruments and active attitude control devices. Linear control theory and attitude stabiliza-
tion. Prereq: 551, Mathematics 471.

571 Finite Elements for Engineering Applications (3) Same as Engineering Science 551 and Mechanical Engineering 561.

572 Computational Fluid Dynamics (3) Same as Engineering Science 552 and Mechanical Engineering 562.

573 Computational Solid Mechanics (3) Same as Engineering Science 553 and Mechanical Engineering 563.

574 Space Engineering: Satellite Technology (3) Satellites and rockets (orbit, launch vehicles and launching), spacecraft structure, power systems, at-	titude control system, telemetry/tracking/command and communication systems, spacecraft testing, reli-
ability, and application of satellites (communication, weather, Earth observation, and future applications). Prereq: 425, Mathematics 471, 404.

590 Selected Engineering Problems (2-6) Enroll-
ment limited to students in programs problem. Prereq: Consent of advisor. May be repeated. Maximum 6 hrs. S/NC only.

595 Seminar (1) All phases of aerospace engineering, reports on current research at UT and UTSI. 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, Boltzmann equation, conduction and diffusion in ionized gases, continuum magnetohydrodynamic equations. Prereq or coreq: 512. Prereq: Mathematics 561 or equivalent.

632 Magnetohydrodynamics II (3) Alfvén and shock relations; solution of governing equations; chan-
nel flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics. Prereq or coreq: 512. Prereq: Mathematics 561 or equivalent.

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-
rium vibrational and chemical flow, non-equilibrium kinetic theory, flow with translational non-equilibrium. Prereq: 522, Mechanical Engineering 522.

645 Theory of Turbulence (3) Same as Engineering Science 555.

661-62 Advanced Topics in Computational Fluid Dynamics (3,3) Same as Engineering Science 651-52 and Mechanical Engineering 651-52.

663-64 Advanced Topics in Computational Solid Mechanics (3,3) Same as Engineering Science 653-54 and Mechanical Engineering 653-54.

681 Advanced Viscous Flow Theory (3) Critical issues of significance to governing equations. Nature of boundary layer approximation as singular perturba-
tion problem. Uniqueness and existence of solutions. Applications of group theory. Special problem areas of interest to students. Prereq: 512, continuum mechan-
is, and Mathematics 562.

690 Advanced Topics in Aerospace Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
Biomedical Engineering

GRADUATE COURSES


430 Biomedical Engineering Laboratory (3) Experience with unique problems associated with making measurements and interpreting data in living systems; experiments: mechanical testing of biological materials, imaging and physiological measurements. Prereq: 310 Biomechanics, 346 Design of Experiments or consent of instructor.

435 Bioinstrumentation (3) Nature of biomedical signals, transducers, signal processing, noise, telemetry and display devices. Prereq: 300 Engineering Physiology, Electrical and Computer Engineering 301 Circuits and Electro Mechanical Components.


495 Special Project in Biomedical Engineering (1-3,1-3) Problems related to recent developments and practice. May be repeated. Maximum 6 hrs. Prereq: Junior or senior standing, consent of instructor.

500 Thesis (1-15)GRADUATE COURSES

571 Biomechanics of Hard and Soft Tissue (3) (Same as Engineering Science 571.)

572 Biomedical Fluid Mechanics (3) (Same as Engineering Science 572.)

528 Ceramic Matrix Composites: Material and Mechanics (3) Micromechanics and microstructural design; fabrication of ceramic matrix composites; interface characterization and mechanics; electron microscopy; destructive and nondestructive evaluation; fracture; fatigue; applications. Prereq: Consent of instructor. (Same as Materials Science and Engineering 528.)

529 Fatigue of Engineering Materials (3) Fatigue life prediction; fatigue crack initiation, crack propagation. Variable amplitude loading, multi-axial loading, environmental fatigue, creep fatigue, metallurgical and microstructural variables, fractography, non-metals. Prereq: Consent of instructor.

533 Dynamics (3) (Same as Mechanical Engineering 533 and Aerospace Engineering 533.)

534 Mechanical Vibrations (3) (Same as Mechanical Engineering 534 and Aerospace Engineering 535.)

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. (Same as Aerospace Engineering 539 and Mechanical Engineering 539.)

541 Fluid Mechanics I (3) (Same as Mechanical Engineering 541 and Aerospace Engineering 541.)

542 Fluid Mechanics II (3) (Same as Mechanical Engineering 542 and Aerospace Engineering 542.)

551 Finite Elements for Engineering Applications (3) Computational procedures for differential equation statements in engineering and sciences. Approximation, boundary conditions, function, finite element implementations; comparison to legacy finite difference methods. Applications in 1, 2, and 3 dimensions, non-linearly, unsteady problems, coupled equation systems. Examples from diverse technical fields: fluid mechanics, heat/mass transfer, elasticity, electromagnetics, reacting systems. Computer projects. Prereq: Consent of instructor. May be repeated with consent of department.

557 Neural Networks in Engineering (3) (Same as Nuclear Engineering 577 and Mechanical Engineering 577.)

566 Optical Engineering I (4) Wave optics; scalar diffraction theory; introduction to Fourier optics; ray or geometric optics; aberration theory; fundamental design methods; introduction to aberrations.

568 Optical Engineering II (4) Statistical optics; spontaneous and induced emission; black and gray body radiation; coherent and partially coherent radiation; mutual coherence function; detectors; radiometry. Prereq: 566.

571 Biomechanics of Hard and Soft Tissue (3) Introduction to terminology, physiology, and analytical methods for mechanics of living tissue. Continuum mechanics of analysis of hard and soft tissue, biological fluid flows. Flow properties of blood, rheology of blood in micro vessels; bioviscoelasticity of fluids and solids, mechanical properties of blood vessels; skeletal and smooth muscle, bone, cartilage. Research paper. (Same as Biomedical Engineering 571.)

572 Biomedical Fluid Mechanics (3) Application of fluid mechanics theory to fluid flows in living systems. Relations to differential equations of motion for blood flow in arteries, veins and the microcirculation. Measurement of flow properties of blood and other biological fluids. Analysis of pathological flow through arterial stenoses. Study of flow through artificial heart valves and in extracorporeal devices. Prereq: 541. (Same as Biomedical Engineering 572.)

576 Expert Systems in Engineering (3) (Same as Nuclear Engineering 576 and Mechanical Engineering 576.)

577 Nuclear Networks in Engineering (3) (Same as Nuclear Engineering 577 and Mechanical Engineering 577.)

578 Fuzzy Systems in Engineering (3) (Same as Nuclear Engineering 578.)

581 Special Topics in Engineering Mechanics (3) Mechanics of problems related to recent developments. Prereq: Consent of instructor. May be repeated with consent of department.

585 Industrial Pollution Prevention (3) (Same as Chemical Engineering 581 and Environmental Engineering 581.)

590 Selected Engineering Problems (2-6) Enrollment limited to students in programs program. Prereq: Consent of advisor. May be repeated. Maximum 6 hrs. S/NC only.

595 Seminar (1) All phases of engineering science, reports on current research at UTK and UTSA. May be repeated. S/NC only.

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

624 Viscoelasticity (3) Viscoelastic constitutive relations; isothermal boundary value problems; wave propagation in viscoelastic materials; stability problems; determination of viscoelastic properties. Prereq: 523, and 539 or Materials Science and Engineering 541.


633 Advanced Vibrations (3) Free and forced vibration, eigenvalues and eigenvectors, two- and three-dimensional formulations: isoparametric elements, numerical quadrature. Equation solving, matrix iteration techniques. Applications in beams, plates and shells; use of representative computer programs in PC and networked Unix-CAD solids modeler. Prereq: 321 Mechanics of Materials I or equivalent. (Same as Aerospace Engineering 561 and Mechanical Engineering 571.)

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, boundary layer, pressure 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 descriptions of turbulence; isotropic and small eddy, Chapman-Enskog theory for turbulent diffusion by continuous movement; applications to turbulent jets, wakes, pipe flow, and boundary layers. Prereq: 542. (Same as Aerospace Engineering 645.)

651-52 Advanced Topics in Computational Fluid Dynamics (3-3) Models of propagation of non-linear Navier-Stokes systems. Algorithm construction; finite element, finite volume; accuracy, convergence, stability, smooth and non-smooth solutions; shocks, artificial dissipation mechanisms. Two- and three-dimensional, compressible viscous and inviscid
flows; potential, Euler and complete Navier-Stokes descriptions; turbulence closure models, reacting flows; mixed subsonic-supersonic. Computer projects, production software. Prereq: 551, 552. (Same as Aerospace Engineering 651-52 and Mechanical Engineering 661-62.)

553-54 Advanced Topics in Computational Solid Mechanics (3,3) Fracture mechanics; singularity solutions; strain-line constitutive properties, variable stiffness, initial strain-stress methods, plasticity, creep; geometrically non-linear problems, large deflection, stability, shell structures, solids; accuracy, convergence, adaptive grids; systems of nonlinear equations, solvers. Use of production-level finite element software. Computer projects. Prereq: 553. (Same as Aerospace Engineering 553-54 and Mechanical Engineering 663-64.)

557 Computational Mechanics Seminar (1) Current developments in computational fluid/thermal/structural 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.

Mechanical Engineering

NOTE: Not all the courses listed below are available at both the UT and the UTSI campuses.

GRADUATE COURSES


451 Systems and Controls (3) Analytical models of physical systems; comprised of combinations of mechanical, fluid, electrical, and thermal systems. Analysis and design of feedback control systems using transient and frequency response techniques. Stability analysis of control systems. Prereq: 345 Instrumentation and Measurement, Electrical and Computer Engineering 301 Circuits and Electro Mechanical Components.


455 Introduction to Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering solid mechanics system. Participation in team design effort; design report. Prereq: Dynamics and Vibrations of Machines.

456 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering thermal-fluid system. Participation in team design effort; design report. Prereq: 332, 344. F


469 Machine Design (4) Design of complete machine; documentation, complete specifications, design calculations, working drawings, and cost analysis. Written and oral report. Prereq: 455, 466. Sp

471 Refrigeration and Air Conditioning (3) Vapor compression and absorption cycles; heat pump systems; psychrometric processes; air washers; cooling towers; solar radiators; building heat transmission. Prereq: 332, 344.

475 Thermal Engineering (3) Thermal systems, turbomachinery, heat exchangers, combustion and system analysis and design, second law and economic analysis. Prereq: 332, 344. F, Sp

479 Thermal Engineering Design (4) Design of complete thermal-fluid system, economic, technical and optimization aspects. Participation in team design effort, formal presentations and design report. Prereq: 456, 475. Sp

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

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

494-95 Selected Topics in Mechanical Engineering (1-1.5-1.5) Problems and topics related to developments and practice in mechanical engineering. Prereq: Consent of instructor. E

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

502 Registration for Use of Facilities (1-15) Admission to the University facilities 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 Product Development Process (1) Basic elements in product development process and project management. Business and engineering interrelations to development and commercial manufacturing of new products. Multidisciplinary teams to explore possible new product opportunities. Prereq: Consent of instructor. (Same as Industrial Engineering 504.)

505 Mechatronics (3) Application of microcomputers to control electromechanical devices. Application and theory of microcontroller language (assembly and high level) and microcontroller systems. Microprocessor hardware, memory, and interfacing. Prereq: 451 Fluid Mechanics I. F

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

508 Integrated Product, Process and Manufacturing System Design (3) (Same as Industrial Engineering 508.)

509 Project Management (1) (Same as Industrial Engineering 509.)

510 Prototype Development and Evaluation (3) Prototype of selected project made and tested against required operating conditions. Design changes implemented to meet customer’s needs. Fabrication drawings and manufacturing plans finalized for introduction of pilot production. Prereq: 555. F


512 Heat Transfer II (3) Analysis of steady-state and time-dependent heat conduction by numerical methods. Analysis of laminar and turbulent convection heat transfer in internal flows, forced and buoyancy driven flows. Prereq: 541.

514 Phase Change Heat Transfer (3) Mechanisms and modeling of nucleate, transition and film boiling processes; critical heat flux; forced convection boiling and post dry-out heat transfer; conduction processes; heterogeneous nucleation; dropwise and filmwise condensation; flow condensation; liquid-solid phase change processes. Prereq: Mathematical modeling. Prereq: 344, 511.


521-22 Thermodynamics I and II (3,3) Macroscopic thermodynamics, including First and Second Law analyses, availability, phase and chemical equilibrium constructions, specification of reliability, and error bounds; transition from molecular structure, spectroscopic data, kinetic theory, statistical mechanics, quantum physics, Schroedinger equation. Prereq: 332.

523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instructor.

525 Combustion and Chemically Reacting Flows (3) Fundamentals of chemical kinetics and conservation equations; phenomenological approach to laminar flames; diffusion and premixed flame theory; single droplet combustion; deflagration and detonation theory; stabilization of combustion waves in laminar streams; flammability limits of premixed laminar flames; introduction to turbulent flames. Prereq: 522, 541, or consent of instructor.

526 Combustion and Chemically Reacting Flows II (3) Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of probability density functions to turbulent flames; advanced reaction models and non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine combustors; furnaces; introduction to supersonic combustion and hypersonic flows. Prereq: 525.

533 Dynamics (3) Kinematics and dynamics of particles in three dimensions. Rotating coordinate systems. Hamilton’s principle. Lagrange’s equations of motion. Kinematics and dynamics of rigid bodies. Prereq: Mathematics 431 or Engineering Analysis, undergraduate vibrations course. (Same as Aerospace Engineering 533 and Engineering Science 533.)

534 Mechanical Vibrations (3) Vibrations of linear, discrete, undamped and damped systems. Lagrange’s equations for holonomic systems. Modal analysis. Laplace transform. Introduction to mechanical transducers. Prereq: Undergraduate vibrations course. (Same as Aerospace Engineering 535 and Engineering Science 534.)


539 Continuum Mechanics (3) (Same as Engineering Science 539 and Aerospace Engineering 539.)

541 Fluid Mechanics I (3) Derivation of equations governing flow of incompressible and viscous fluids (conservation of mass, Newton’s second law, conservation of energy). Equations of state and constitutive relations. Euler and Navier-Stokes forms and nondimensionalization. Exact solutions and introduction to potential and boundary-layer flows. Prereq: Fluid mechanics. (Same as Aerospace Engineering 541 and Engineering Science 541.)

551-52 Mechanical Engineering Design (3,3) Design of mechanical engineering devices and systems. Prereq: Consent of instructor.

555 Design Tools (5) Project driven. Skills for using relevant software design tools to perform assigned design tasks. Concepts and timing of subject material modified to meet specific needs of each project. Prereq: Consent of instructor.

561 Finite Elements for Engineering Applications (3) (Same as Engineering Science 551 and Aerospace Engineering 571.)

562 Computational Fluid Dynamics (3) (Same as Engineering Science 552 and Aerospace Engineering 572.)

563 Computational Solid Mechanics (3) (Same as Engineering Science 553 and Aerospace Engineering 573.)

576 Expert Systems in Engineering (3) (Same as Electrical Engineering 576 and Engineering Science 576.)

577 Neural Networks in Engineering (3) (Same as Nuclear Engineering 577 and Engineering Science 577.)

581 Rocket Propulsion I (3) Rocket propulsion fundamentals; thermodynamics of nonreacting and chemically reacting ideal gases, rocket nozzle design; ideal rocket performance; rocket heat transfer; chemistry of propellants; liquid rocket engine systems; ground testing; introduction to solid propellant rockets. Prereq: Consent of instructor.

582 Rocket Propulsion II (3) Solid propellant rocket performance; homogeneous and heterogeneous propellant chemistry and combustion system performance; thermal decomposition and gas phase reaction models; effect of chamber pressure and additives on solid propellant burn rate; erosive burning; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion; electrical resistance and electric field (ion) engine performance; magnetohydrodynamic thrusters, traveling wave thrusters, exotic propulsion systems. Prereq: Consent of instructor.

584-85 Turbomachinery Systems I, II (3,3) Ideal and real cycle analysis of turbine engines, real cycle analysis, component performance analysis, component design and systems integration (inlets, nozzles, combustors, compressors, turbines), flow through theory, turbine engine component matching, transient operation, surge and rotating stall, engine control systems, structural considerations. Prereq: First year graduate standing and consent of instructor.

586 Mechanics and Control of Robotic Manipulators (3) Fundamentals of robotic manipulation: kinematics and dynamics of manipulators, control systems design, trajectory planning, advanced force and impedance control strategies. Prereq: 451, 533, or equivalent.


588 Introduction to Hybrid Electric Vehicles (3) Series, parallel, and dual configurations. Sizing and analysis of typical HEV components: motors, auxiliary power sources, onboard energy storage, and fuels. Steady-state HEV power train systems design and analysis of complete hybrid electric vehicle systems. Linear control design techniques and discrete logic design applied to HEV power trains and operating mode control. Digital and real-time control and hardware issues of automotive systems. Design and human factors engineering issues of vehicle controls and displays. Prereq: 588 or consent of instructor.

589 Hybrid Electric Vehicle Control Systems Design and Analysis (3) Dynamic modeling, simulation and analysis of complete hybrid electric vehicle systems. Linear control design techniques and discrete logic design applied to HEV power trains and operating mode control. Digital and real-time control and hardware issues of automotive systems. Design and human factors engineering issues of vehicle controls and displays. Prereq: 588 or consent of instructor.

590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor. May be repeated. S/NC only.

594 Culminating Integrated Project Report (3) Final phase of product development process. Multidisciplinary teams submit and defend comprehensive project report. Report includes all engineering and business considerations needed to convince potential investors to fund proposed business venture. Prereq: Consent of instructor. (Same as Industrial Engineering 594.)

595 Seminar (1) All phases of mechanical engineering reports on current research at UTK and UTSA. May be repeated. S/NC only.

599 Special Topics in Mechanical Engineering (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (3-15) Prereq: NP only. E

610 Advanced Topics in Fluid Mechanics and Heat Transfer (3) Advanced theory and application of fluid mechanics and heat transfer; natural convection, multi-phase flow, high speed reacting and nonreacting flows, advanced boundary layer techniques, combustion, perturbation and variational methods of analysis, heat exchanger theory and design. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

613 Advanced Radiation Heat Transfer (3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection heat transfer. Prereq: 511, 512.


624 Advanced Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approaches; equilibrium of pure substances, metastable states. Non-equilibrium thermodynamics. Prereq: Consent of instructor.

651-52 Advanced Topics in Computational Fluid Dynamics (3,3) (Same as Engineering Science 651-52 and Aerospace Engineering 661-62.)

653-54 Advanced Topics in Computational Solid Mechanics (3,3) (Same as Engineering Science 653-54 and Aerospace Engineering 663-64.)


671 Advanced Topics in Applied Artificial Intelligence (3) (Same as Nuclear Engineering 671 and Engineering Science 671.)

686 Telerobotics Systems (3) Analysis of modern telerobotic concepts: review of current research and literature in telerobotics; design and construction of telerobots; software, robotics, and telerobot systems: human-machine interface, control and telesurgical architecture, communications, data acquisition, and sensing. Virtual reality-based, and internet-based systems concepts. Prereq: 586 or consent of instructor.


Medical Biology

See College of Veterinary Medicine and Comparative and Experimental Medicine

Microbiology

(Microbiology of College of Arts and Sciences and College of Veterinary Medicine)

MAJOR DEGREES

Microbiology.................................M.S., Ph.D.
Veterinary Medicine..........................D.V.M.

Robert Moore, Head

Professors:
Beck, Raymond W. (Emeritus).................................Wisconsin
Becker, Jeffrey M., Ph.D..................................Cincinnati
Brian, D. A., Ph.D., D.V.M..................................Michigan State
Montie, T. C. (Emeritus), Ph.D..................................Maryland
Moore, R. N., Ph.D..................................Texas
Riggsby, W. Stuart, Ph.D..................................Yale
Rouse, B. T., Ph.D..................................Guelph
Savage, Dwayne C. (Emeritus), Ph.D..................................California
Saylor, Gary S., Ph.D..................................Idaho
Stacey, G., Ph.D..................................Texas
White, D. C. (Distinguished Scientist), Ph.D..................................Rockefeller
Woodward, J. M. (Emeritus), Ph.D. .......Kansas

Associate Professors:
Hacker, David, Ph.D..................................Michigan State
Small, Pamela, Ph.D..................................Stanford

Assistant Professors:
Urbach, Ena, Ph.D..................................MIT
Wilhelm, Steve, Ph.D..................................Western Ontario

The Department of Microbiology offers both the M.S. and Ph.D. Students have the option of selecting from a variety of graduate research programs. For a departmental brochure, contact the department head.

ADMISSION REQUIREMENTS

Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course 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 many cases, deficiencies in requirements may be removed by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 550 or higher with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members.

Each new graduate student meets with an advisory committee chaired by the 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.

Brian, D. A., Ph.D. (Emeritus) .......Michigan State
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 either a bachelor’s or master’s degree. Students who enter with a bachelor’s degree usually receive the Ph.D. after four or five years; those with the master’s degree usually take three or four years to complete the degree. Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one semester of physical chemistry; (5) one course in statistics; (6) two semesters of biochemistry or molecular biology; (7) satisfactory performance in a comprehensive examination that must be attempted before the end of the fifth semester in the program and passed before admission to candidacy; and (8) the presentation of a research dissertation and its oral defense.

GRADUATE COURSES

410 Bacterial Physiology (3) Modern concepts of structure and function of bacterial cell. Prereq: Intro-duction to Microbiology. Sp

411 Bacterial Genetics (3) Transmission and expression of genetic information by bacteria. Prereq: Intro-duction to Microbiology. Sp

420 Medical Microbiology (3) Disease-producing microorganisms, including bacteria, rickettsia, chlamydia and fungi. Prereq: Introduction to Microbiology. Sp

429 Medical Microbiology Laboratory (2) Laboratory exercises in medically important areas of microbiology: microorganisms, pathogenesis and immunology. Prereq: Introduction to Microbiology Lab. Coreq: 420. Sp

430 Immunology (3) Principles of inflammation and immunity; immunoglobulin structure and theories of formation and diversity; complement, hypersensitivities, cell cooperation and recognition in immune mechanisms; soluble factors. Prereq: General Genetics. F


470 Microbial Ecology (3) Physiological diversity and taxonomy of microorganisms from natural environments. Functional role of microorganisms in natural and simulated ecosystems. Prereq: 310. F

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

502 Registration for Use of Facilities (1-15) Re-quired 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 counted toward degree requirements. May be repeated. S/NC only. E

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

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

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

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

595 General Seminar (1) Lectures and seminars by invited speakers, faculty, and graduate students. May be repeated. Maximum 18 hrs. S/NC only. E

596 Laboratory Rotation (1) Familiarization with research areas in department through series of rota-tions in laboratories of individual faculty members. May be repeated. Maximum 3 hrs. S/NC only. E

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 Journal Club in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E

610 Topics in Microbial Physiology (1-3) Prereq: 410 or consent of instructor. May be repeated. Maximum 12 hrs.

620 Topics in Microbial Pathogenesis (1-3) Prereq: 420, 430 or consent of instructor. May be repeated. Maximum 12 hrs.

630 Topics in Immunology (1-3) Prereq: 430 or consent of instructor. May be repeated. Maximum 12 hrs.

640 Topics in Virology (1-3) Prereq: 440 or consent of instructor. May be repeated. Maximum 12 hrs.

650 Topics in Microbial and Molecular Genetics (1-3) Prereq: 411 or consent of instructor. May be repeated. Maximum 12 hrs.

670 Advanced Topics in Environmental Microbi-ology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

Microbiology-Veterinary Medicine

See College of Veterinary Medicine and Comparative and Experimental Medicine

Modern Foreign Languages and Literatures

(Majors of College of Arts and Sciences)

MAJORS DEGREES

French ............................................................ M.A.

German ............................................................ M.A.

Spanish ............................................................ M.A.

Modern Foreign Languages ................................ Ph.D.

Carolyn R. Hodges, Head

Professors:

Barrette, Paul E., Ph.D. .................................... California

Brady, Patrick (Shumway Chair of Excellence), D.U.P. .... Sorbonne

Campion, Edmund J., Ph.D. ......................... Yale

Cobb, Carl W. (Emeritus), Ph.D. ............. Tulane

Creel, Bryant, Ph.D. ........................................ California

DiMaria, Salvatore, Ph.D. ....................... Wisconsin

Elliott, Jacqueline C. (Emerita), M.A. .... Illinois

Falen, James E. (Emeritus), Ph.D. ................ Pennsylvania

Fiene, Donald M. (Emeritus), Ph.D. .... Indiana

Handelsman, Michael H. (Liaison), Ph.D. ... Florida

Hefflin, William H. (Emeritus), Ph.D. ............ Florida State

Hodges, Carolyn R., Ph.D. ....................... Chicago

Irving, Thomas B. (Emeritus), Ph.D. .... Princeton

Kratz, Henry (Emeritus), Ph.D. ............. Ohio State

Levy, Karen D., Ph.D. ......................... Kentucky

Maurino, Ferdinando D. (Emeritus), Ph.D. ... Columbia

Mellor, C. J., Ph.D. ................................. Chicago

Osborne, J. C. (Emeritus), Ph.D. ............ Northwestern

Pinsky, Clara (Emerita), Ph.D. .................... California

Ritzenhoff, Ursula C. (Emerita), Ph.D. ...... Illinois

Young, Dolly, Ph.D. ............................. North Carolina

Associate Professors:

Beauvois, Margaret, Ph.D. ................. Texas

Blackwell, Stephen H., Ph.D. .............. Indiana

Brioz-Skov, Flavia, Ph.D. ................. Washington

Essif, Les, Ph.D. ............................... Brown

Hoeyng, Peter, Ph.D. ....................... Wisconsin

Kaplan, Gregory, Ph.D. .............. Pennsylvania

Kaplan, Gregory, Ph.D. ....................... Pennsylvania

LaCure, Jon, Ph.D. ......................... Indiana

Lee, David E. (Liaison), Ph.D. ........... Stanford

Nakuma, Constancio, Ph.D. ............. Sorbonne

Ohnesorg, Stefanie, Ph.D. ............. McGill

Pervukhina, Natalia K., Ph.D. .......... Bryan Mawr

Silva-Filho, Euridice, Ph.D. ........ North Carolina

Assistant Professors:

Ayo, Alvaro A., Ph.D. .................... Arizona

Berwald, Olaf, Ph.D. ..................... North Carolina
The Department of Modern Foreign Languages and Literatures offers graduate programs leading to the Master of Arts degree with majors in French, German and Spanish, and the Doctor of Philosophy degree with a major in Modern Foreign Languages. Inquiries should be addressed to the head of the department.

THE MASTER’S PROGRAMS

French

Thesis Option:
1. Completion of a minimum of 24 semester hours in coursework plus at least 6 hours in course 500 Thesis. French 501 is required. 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 French 501. 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.

German

Thesis Option: The minimum requirements are 24 semester hours of coursework and 6 hours of Thesis 500. German 510 and 519-20 are required, as are three courses on German literature or culture, one of which may be taken at the 400 level. In addition, students must take three further courses, only one of which may be chosen from 411-12 or 485. All graduate teaching assistants should take 512, and other candidates may take 512 or any other 500-level course. A maximum of three 400-level courses may be counted toward the 30 semester hours of coursework. A common written exam over the designated reading list is required, as is a standardized language exam, such as the Zentrale Mittelstufenprüfung. Each non-thesis M.A. candidate will have a committee of three faculty members in German to whom the student will submit a dossier consisting of the seminar paper and one paper previously submitted in a graduate course. The length and type of the papers is described in greater detail in the Manual for Graduate Students in German.

Spanish

Thesis Option:
1. Completion of a minimum of 24 semester hours in coursework plus at least 6 hours in course 500 Thesis. Spanish 550 is required. 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 6 at the 400 level, the rest at the 500 level, including Spanish 501. 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.

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages requires advanced training in a major language and either a second language or applied linguistics.

Admission Requirements

1. A bachelor’s degree with a GPA of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them.

Degree Requirements

1. First Concentration: German. A minimum of 39 hours of German courses beyond the bachelor’s degree, distributed as follows: 400 level: A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
2. Second Concentration. A minimum of 18 (Track I) or 27 (Track II) hours must be taken. These must include French 512, 519, 584 or Spanish 512, 519, 550. Thesis hours are excluded. If 512 is used as part of a second concentration in applied linguistics, another course must be substituted in the first concentration.
3. First Concentration: French or Spanish. A maximum of 6 at the 400 level or 12 at the 500 level must be taken, exclusive of dissertation hours.

Non-Thesis Option: A minimum of 18 (German or Track I) or 12 (Track II) hours beyond the bachelor’s degree, taken in the field of applied linguistics or in a second language, either French, German, Italian, Portuguese (Track II only), Russian or Spanish. For Track I and German, 12 of these hours must be at the 500 level or above. For Track II, 3 of these hours must be at the 500 level or above.

French students choosing applied linguistics must take French 421 or 429; 425; 512; and 9 (Track I) or 3 (Track II) hours of appropriate electives in English or French.

German students choosing applied linguistics must take German 421 or 429; 425; 512; and 9 (Track I) or 3 (Track II) hours of appropriate electives in English or French.
Asian Languages

GRADE 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.

French

GRADE 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 Lyons and members of Pèiáide. Prereq: 300-level literature course.


413 French Literature of the 18th Century (3) Major works of Enlightenment. Prereq: 300-level literature course.


420 French Cinema (3) French cinema from earliest days through New Wave directors. Prereq: 300-level literature course. May apply toward major. (Same as Cinema Studies 420.)

421 Phonetics (3) Foundation in science of phonetics. Practical exercises and individual performance. Graduate credit not offered to students majoring in Romance language. Prereq: Intermediate Composition and Conversation, or equivalent. (Same as Linguistics 421.)

422 Advanced Grammar (3) Improving one’s written French by studying basic and more refined structures of French language. Writing creative free-style compositions. Prereq: Intermediate Composition and Conversation or French for Business.

423-24 Advanced Conversation (1,1) Informal conversation with native speaker on contemporary topics. Stresses in-class contact rather than outside preparation. (Same as Intermediate Composition and Conversation or French for Business.) 2 hrs. weekly.

425 Introduction to Descriptive Linguistics (3) Theory and practice of techniques of linguistic analysis in subfields of phonetics, phonology, morphology, syntax, semantics, pragmatics and historical linguistics; discussion of relevance to learning and teaching of foreign languages and to study of literary texts. Recommended prereq: Language, Linguistics and Society. (Same as German 425, Linguistics 425, and Spanish 425.)

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

429 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)


431 Highlights of French Civilization (3) Survey of French civilization from the Gauls to World War II. Historical events, daily life, all forms of arts. Prereq: 300-level literature course.

432 Contemporary French Culture (3) Current French cultural issues placed in historical perspective with comparative emphasis. Taught in English; readings in French for majors.

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 Jesuits, and literature of contemporary Quebec. Prereq: 300-level literature course.

445 Advanced French for Business (3) Advanced contemporary French language and culture as relates to business transactions. Comparative approach to explore differences and similarities between francophone business culture(s) and those of North America and Japan. Building knowledge of business terminology while being sensitized to cultural differences and dangers of simplistic stereotyping. Prereq: French for Business or consent of instructor.

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

501 Techniques in Literary Analysis (3) Required for M.A. program. Close stylistic analysis of texts representative of different eras and of different genres. Development and improvement of student’s written French.

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 classes. May not be used toward degree requirements. May be repeated. S/NC only. E

510 The French Language (3) French as spoken and written from Medieval period to present.

512 Teaching a Foreign Language (3) Practical methods of teaching and evaluating basic language skills and foreign language skills, and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.

515 Technology Enhanced Language Learning (3) Introduction to TELL. Overview of existing software, programs, and professional literature on topic. Hands-on development of institutional Web site for teaching language, culture, or literature.

519 Bibliography and Methods of Research (3) Critical research tools and scholarly contributions in French literature and language. Practical exercises on compiling of scholarly data using computer-based and non-computer-based sources.

520 French and Francophone Film (3) French and Francophone culture through film.

530 French and Francophone Theater (3) Changing approaches to French and Francophone Theater.

540 French Literature and Culture I (3) Literary and cultural heritage of French Middle Ages.

550 French Literature and Culture II (3) Literary and cultural heritage of 16th - and 17th -century France.

560 French Literature and Culture III (3) Literary and cultural heritage of 18th - and 19th -century France.

570 French and Francophone Literature and Culture I (3) Literary and cultural heritage of France and other Francophone countries in first part of 20th century.

573 French and Francophone Literature and Culture II (3) Literary and cultural heritage of France and other Francophone countries from late 20th century to present.


584 Modern Theory and Criticism (3) Survey of twentieth century critical theory, including psychoanalysis, Marxism, structuralism and more.
German

GRADUATE COURSES

331-32 Elements of German for Upper-Division and Graduate Students (3,3) Elements of language, ele-
mentary and advanced readings, and a final 10,000-
word translation project. Open to graduate students
preparing for language examinations, and upper-divi-
sion students desiring reading knowledge of the lan-
guage. No credit for students having completed 101-
2. May be repeated. Maximum 6 hrs. Undergradu-
ate credit only.

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

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

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

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

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

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

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

425 Introduction to Descriptive Linguistics (3)
(As same French 425, Spanish 425, and Linguistics
425.)

426 Methods of Historical Linguistics (3) Phonetics,
distinctive feature analysis, sound change types,
nature of sound change, principles of reconstruction,
and fundamental assumptions about language change
through time. Survey of non-phonological linguis-
tic change, language families, Proto-Indo-European,
and other proto languages. Prereq: 6 hrs of upper divi-
sion foreign language courses (excluding courses in trans-
lation or graduate reading courses). (Same as French
426, Spanish 426, and Linguistics 426.)

435 Structure of the German Language (3) Con-
trastive English-German segmental and superseg-
mental phonemes, contrastive English-German lin-
guistic structures, selected topics in advanced Ger-
man grammar and syntactic analysis. Prereq: 6 hrs of
upper division German language courses (excluding
courses in translation and graduate reading courses).
(Same as Linguistics 435.)

436 History of the German Language (3) Deve-
lopment 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

Italian

GRADUATE COURSES

401 Dante and Medieval Culture (3) Introduction to
significance of this great Italian writer. Prereq: 212 or
consent of instructor.

402 Petrarch and Boccaccio (3) Prereq: 212 or
consent of instructor.

403 Literature of the Rinascimento (3) From Pulci
to Tasso, Quattrocento and Cinquecento. Prereq: 212 or
consent of instructor.

405 Modern Italian Poetry (3) From Pascoli to
Montale. Prereq: Italian 212 or consent of instructor.

406 The Modern Italian Novel (3) From Manzoni
to Calvino. Prereq: 212 or consent of instructor.

409 Directed Readings (3)

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. Maxi-
num 6 hrs. (Same as Cinema Studies 421.)

591 Foreign Study in Italian Literature (3) Topics vary.
May be repeated with consent of department.

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

594-95 French Directed Readings (3,3)

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

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

Portuguese

GRADUATE COURSES

400 Portuguese for Speakers of Another Romance
Language (3) Accelerated class for beginning stu-
dents of Portuguese with strong background in another
Romance language. Introduction to grammar, reading
and culture of Portugal and Brazil. Prereq: 3 hours at
300-level in another Romance language or equivalent.

431-32 Topics in the Literature & Language of
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 Arts and
Sciences.

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

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

Russian

GRADUATE COURSES

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

430 Selected Topics in Russian Literature (3)
Content varies. May be repeated. Maximum 9 hrs.

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

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

550 Studies in Russian Literature (3) Content
varies. May be repeated. Maximum 9 hrs.

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

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

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

GRADUATE COURSES

421 Phonetics (3) Prereq: Intermediate Conversation and Composition or consent of instructor.


423 Advanced Composition and Conversation (3) Development of writing and speaking skills at advanced level, wide range of topics and situations. Varied in class and extra-class activities. Not available for credit for students whose level of proficiency in Spanish is superior as defined by the ACTFL Proficiency Guidelines or for graduate students in the Spanish M.A. or Ph.D. programs. Prereq: 323 Intermediate Composition and Grammar.

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

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

429 Romance Linguistics (3) (Same as French 429 and Linguistics 429.)

430 Topics in Hispanic Linguistics (3) Spanish language through different areas of linguistics: phonology, morphology, syntax, semantics, sociolinguistics, dialectology and second language acquisition. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present, 333 Survey of Spanish American Language: 1700-Present and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department. (Same as Linguistics 431.)

433 Images of Woman in Hispanic Literature (3) Major Hispanic texts (and/or women authors) in light of relation of female personality to particular cultural and historical context, role of women in society, patriarchal tradition, woman as cultural and as aesthetic value ("the feminine symbolic"), and feminist theoretical issues. Prereq: 323 Intermediate Composition and Grammar, 330 Textual Analysis and completion of 9 additional hours of upper division Spanish.

434 Hispanic Culture through Film (3) Analysis of selected cultural structures. Not available to native or bilingual students of Spanish without consent of department. Prereq: 323 Intermediate Composition and Grammar.

435 Topics in Latin American Studies through Popular Culture: Local and Global Perspectives (3) To be determined. Topics vary. May be repeated with consent of department. Maximum 6 hrs.

461 Special Topics (3) Aspects of Hispanic culture, language, linguistics, or foreign language pedagogy. Topics vary. May be repeated with consent of department. Maximum 6 hrs.

465 Latin American Film and Culture (3) Latin American and Latino/a films and videos from 1900s to present in light of political, cultural, and social contexts. Taught in English. Graduate credit available only for Latin American Studies and Cinema Studies majors or with consent of department. Prereq: 22 hrs second language study and 2 hrs Cinema Studies. (Same as Latin American Studies 465 and Cinema Studies 465.)

479 Disenchedted Texts in Hispanic Literature (3) Texts representing trends and periods of renewal in Spain and Latin American countries. Topics vary. Content varies. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present, and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department. (Same as Latin American Studies 479.)

480 Social Forces in Hispanic Literary Expression (3) Analysis of major Hispanic texts that address factors and events that influenced and,or continue to influence, society and cultural evolution of Hispanic world, including literature itself. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department.

482 Trends in Hispanic Thought (3) Intellectual/philosophical currents represented in literary works, selected thinkers and cultural movements from historical periods of Spain and Latin American countries. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present, and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department.

484 Race, Ethnicity, and Nation in Hispanic Literature (3) Close reading and analysis of literary texts that deal with issues of race and ethnicity in Hispanic world, with regard to identity and concepts of nationhood. Topics: mestizaje; conceptual distinctions between race and ethnicity in Latin America; indigenismo; Afro-Latin American culture and identity; relations between Jews, Christians, and Moors in Spain. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department.

486 Literary and Artistic Movements in the Hispanic World (3) Literary and artistic currents, cultural developments, political, aesthetic, philosophical, etc. between major trends and movements dealing with topics from Middle Ages to present day. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department.

489 Topics in Hispanic Civilization (3) Analysis of major trends, issues and/or movements in the civilizations of Spain and Spanish America. Political, literary, and cultural perspectives dealing with topics from Middle Ages to present day. Prereq: 323 Intermediate Composition and Grammar, 332 Survey of Spanish Language: 1700-Present and completion of 9 additional hours of upper division Spanish. May be repeated. Maximum 6 hrs with consent of department.

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

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

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

531 Old Spanish (3) Evolution of Spanish language from its origins through 15th century.

532 Medieval Spanish Literature (3) Literary works of 11th through 15th century. Application of literary theories to understanding of literature, nature and evolution of major literary genres during Middle Ages, and socio-historical contexts of medieval works. May be repeated. Maximum 6 hrs with consent of department.

533 Golden Age Prose (3) Wide range of prose fiction in Spanish during centuries of Lope de Rueda, Picartesque, sentimental, pastoral and exemplary novels, and dialogues.

534 Don Quijote (3) Cervantes’ masterpiece in socio-cultural and literary context of its times: study of thematic, structural, and stylistic issues; crisis of aristocracy, Quixotic “madness,” discreet cognizant and ethical perspectives, satiric irony, culture of sentiment, and Cervantes’ legacy to subsequent literary periods. Content varies. May be repeated. Maximum 6 hrs with consent of department.

535 Golden Age Poetry (3) Garcilaso, Fray Luis de León, San Juan de la Cruz, Lope de Vega, Quevedo, and Gongora. Prereq: 533 Golden Age Prose.

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.


541 19th-Century Spanish Prose (3) Costumbrismo, realism, and naturalism in the novel, short story, and essay as represented in major authors: Larra, Mesonero Romanos, Fernán Caballero, Alarcon, Valera, Palacio Valdés, Pereda, Galós, Pardo Bazán. Content varies. May be repeated. Maximum 6 hrs with consent of department.

542 20th-Century Spanish Literature: Generation of '98 through Civil War (3) Principal achievements and representative directions in literature of Spain through Civil War years.

543 20th-Century Spanish Literature: Post-Civil War through Present (3) Principal achievements and representative directions in literature of Spain from Post-Civil War period to present.

550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis. Exploration of bibliographic 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 Spanish Colonial Literature (3) From pre-Columbian era through 18th century. Reading and analysis of selected works from Colonial Spanish American period and their Continental sources. Indigenous texts and authors. Content varies. May be repeated. Maximum 6 hrs with consent of department.


571 Spanish American Narrative: Criollismo to 1850 (3) Critical study of major trends and movements that shaped Spanish American narrative during first half of 20th century. Content varies. May be repeated. Maximum 6 hrs with consent of department.

572 Spanish American Narrative: Boom to Present (3) Critical study of major trends and movements that established Spanish American narrative as influential force in world literature during second half of 20th century. Content varies. May be repeated. Maximum 6 hrs with consent of department.

573 Regional Approaches to Interpreting Spanish American Literature (3) Interpretation of Spanish American literature taking into consideration regional differences attributed to factors such as race, geography, immigration, and economic development. Key regions include Mexico and Central America, Caribbean, Andean countries, and the Southern Cone. Course readings vary between specific regional perspectives and transregional one. Content varies. May be repeated. Maximum 6 hrs with consent of department.


576 Contemporary Spanish American Poetry (3) Critical study of major poets in Spanish America from
Music

(College of Arts and Sciences)

MAJOR DEGREES

Music ....................................................... M.M.

Roger L. Stephens, Director

Professors:

Bitzas, George C., M.M. .......... Converse
Brock, John P., M.M. .......... Alabama
Coker, J., M.A. .......... Sam Houston
Combs, F. M., M.A. .......... Missouri
Jacobs, K. A., D.M.A. .......... Texas
MacMorrain, W. S., M.M. .......... Wisconsin
McClelland, D. K., M.A. .......... Columbia
Moore, M. C., Ph.D. .......... Michigan
Northington, D. B., M.D.A. .......... Yale
Pederson, D. M., Ph.D. .......... Iowa
Souza, G., Ph.D. .......... Ohio State
Stephens, Roger L., M.M. .......... East Carolina
Stutzenberger, D. R., D.M.A. .......... Maryland

Associate Professors:

Adams, Fay, M.M. .......... Tennessee
Batey, A. L., D.M.A. .......... South Carolina
Binder, S. L., D.M. .......... Florida State
Boiling, M. E., M.M. .......... Tennessee
Brown, Donald R., Hs.D. .......... Delaware
Brunell, D. E., D.M. .......... Indiana
Carter, P. Z., M.M. .......... Colorado
Davis, Dolly C., Ph.D. .......... Iowa
Freeman, Carroll, M.P.A. .......... Oklahoma City
Gay, Jr., L. C., Ph.D. .......... Columbia
Hough, Don, M.M. .......... Tennessee
Leach, C. F., D.M. .......... Northwestern

Murphy, B. A., Ph.D. .......... Ohio State
Royce, David, Ph.D. .......... Kent State
Searle, S. R., M.M. .......... University of Cincinnati
Smith, C., B.M. .......... SUNY-Fredonia
Sperl, G. R., M.M. .......... Indiana
Zelenovich, Matus, M.A. .......... Lvy

Assistant Professors:

Baldwin, Wesley, D.M.A. .......... Maryland
Haar, Paul, M.M. .......... Kansas
Hawthorne, W., Ph.D. .......... Cincinnati
Keathley, Elizabeth, Ph.D. .......... SUNY (Stony Brook)
Powell, Edward, M.M. .......... Cincinnati
Richter, Jorge, M.M. .......... Andrews
Ryder, Donald, D.M.A. .......... Iowa
Walters, Christy, D.M. .......... Florida State
Wentzel, A. N., M.M. .......... Southern Cal

The School of Music offers the Master of Music degree with concentrations in accompanying, choral conducting, composition, instrumental conducting, jazz, music education, music therapy (with an optional emphasis in music technology), musicology, performance (organ, piano, strings, voice, winds, and percussion), and piano pedagogy and literature.

Applicants must have completed an undergraduate degree that is approximately equivalent in music requirements to degrees conferred by UT, with a major 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 for the appropriate area faculty. 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 entering master's degree students are required to take Diagnostic Examinations in music theory, ear-training, and music history/literature. These examinations are given by the School of Music at the beginning of each semester.

THE MASTER'S PROGRAM

A minimum of 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 bibliography, music history/literature and music theory and allow for elective courses. Specific curricula are available from the department. All concentrations require a written and oral final examination.

A thesis is required of students in composition, musicology, and music theory. A graduate recital or performance project is given in lieu of thesis by students with concentrations in performance, pedagogy, jazz, accompanying, choral conducting, and instrumental conducting.

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. Both thesis and non-thesis options are available.

Music Education

GRADUATE COURSES

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

520 Research in Music Education (3) Design and evaluation 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.

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


570 Studies in Multicultural Music Education (3) Study of music literature, art and customs of various cultures appropriate for students in grades K-8. Strategies and techniques for teaching music at this level.

571 Musical Repertoire Laboratory (1) Performance of music from various cultures: production of musicals appropriate for students in grades K-8. Singing, dancing, acting, costumes, set design, traditional and non-traditional instrumental ensembles. Limited to students majoring or concentrating in art, dance or theatre. Prereq or coreq: 570. May be repeated. Maximum 2 hrs.


575 Professional Internship in Teaching (1-8) Teaching and teaching-related experiences in professional settings in public schools. Enrollment limited to post-baccalaureate students in professional year program. Prereq: Admission to Teacher Education program and consent of School of Music. May be repeated. Maximum 12 hrs. S/N/C only. F, Sp.

580 Seminar in Music Education (3) Class investigation and individual reporting of pertinent topics and issues in music education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

591 Clinical Studies (4) Group and individual seminar activities during full-time internship. Application and evaluation of professional competencies. Completion and presentation of portfolio and analysis of teaching project. Coreq: 575.

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

Music Ensemble

GRADUATE COURSES

Prerequisite: By audition or consent of instructor.

502 Jazz-Saxophone Ensemble (1) May be repeated. Maximum 4 hrs.
Music General

GRADUATE COURSES
500 Thesis (1-15) P/NP only. E
501 Graduate Recital (2) 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 Music Bibliography (3) Bibliographic methodology in music. F
511 Lecture Recital (2) E
520 Musical Styles (3) Elements of design and their role in definition of musical styles. Prereq: Consent of instructor.
521 Special Topics in Performance (1-3) Prereq: Consent of department head. E
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 4 hours credit on each instrument. Admission by audition. Requires payment of Applied Music fee. E

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.
580 Band History and Literature I (3) Antiquity to 1900.
581 Band History and Literature II (3) 1900 to present.
583 Recitative for Instrumental Conductors (1) Problems in conducting recitatives. Prereq: Consent of instructor. S/NC only.
584 Practicum for Instrumental Conductors (1) Intern experience in field other than area of major interest. S/NC only.
590 Advanced Instrumental Conducting (2) Physical techniques of conducting, study and analysis of scores, rehearsal techniques. Attention to individual problems. Requires applied music fee. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.
595 Instrumental Conducting Performance (1) Preparation and juried performance of band or orchestral work(s). Prereq: Consent of instructor.

Music History

GRADUATE COURSES
410 Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.
420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools, 1600-present.
430 Symphonic Literature (3) Literature for orchestra from Baroque to present, evolution of symphony.
450 Composer Seminar (3) Life and works of single composer. Subjects vary.
460 Music Aesthetics (3) Nature of music and musical experience, sense perception and emotions, music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.
480 Music in Christian Worship (3) Hymnody, liturgies, and liturgical music.
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 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.
585 Topics in Music of the Americas (3) Topics vary.
590 Introduction to Ethnomusicology (3) Ethnomusicology as scholarly discipline. History, theories, and methodologies as applied to study of music in culture. Prereq: Music in World Culture or equivalent.
593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of department head.
595 Seminar in Ethnomusicology (3) Topics vary. Prereq: Registration for Use of Facilities (1-15) P/NP only. E

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 II (3) 420--From 1750 to middle 19th century; 430--Middle 19th century to present.
460-70 The Organ and Its Literature II (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.
480 Teaching Class Piano (3) Historical survey and evaluation of teaching materials and methodology for college and/or adult beginning piano classes, with collaborative teaching experience. Prereq: Consent of instructor.
485-95 Suzuki Piano Method I (2,2) Psychology, procedures, and literature of Suzuki piano method. Must be taken in sequence. Prereq: Consent of instructor.
490-491 Internship (2,2) Opportunity for pedagogy students to gain experience in teaching beginning students under supervision of experienced instructors. Weekly discussion seminars.
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: Consent of instructor. 550--Introduction and principles of Kodaly, Orff, Suzuki, Dalcrose Eurhythmics, and class piano teaching. Prereq: 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)
425 Horn (1-4)
430 Trumpet (1-4)
435 Trombone (1-4)
440 Baritone (1-4)
445 Tuba (1-4)
450 Percussion (1-4)
455 Voice (1-4)
460 Violin (1-4)
465 Viola (1-4)
470 Cello (1-4)
475 String Bass (1-4)
476 Electric Bass (1-4)
479 Guitar (1-4)
480 Piano (1-4)
Music Technology

GRADUATE COURSES

540 Computer Music Transcription (3) Projects in notation, playback, and publication of music incorporating elements of word processing, graphic design, sequencing, and page layout. Study of MIDI protocol as applied to computer music work station design. No credit toward M.M. concentration in Music Theory with technology emphasis. Prereq: Consent of instructor.

550 Percussion (1-4)

551 Accompanying and Coaching (1-4)

555 Voice (1-4)

560 Violin (1-4)

565 Viola (1-4)

570 Cello (1-4)

575 String Bass (1-4)

576 Electric Bass (1-4)

579 Guitar (1-4)

580 Piano (1-4)

585 Harpsichord (1-4)

590 Organ (1-4)

594 Composition (1-3)

595 Composition with Electronic Media (1-3)

599 Improvisation (1-4)

Music Theory

GRADUATE COURSES

430 Counterpoint I (3,3) 430—Study of species counterpoint in modal and tonal styles, works of Palestrina and J. S. Bach. 430- Prereq: 210 Theory Ill and 230 Advanced Ear Training IV with grade C or higher. 440 - Prereq: 430 with grade C or higher.

450 Choral Arranging (2) Analysis of scores and writing of arrangements for choruses. Prereq: 210 Theory Ill and 240 Advanced Ear Training IV with grade C or higher, or consent of instructor.

520 Analytical Techniques (3) Analytical techniques, contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.

530 Music Theory Pedagogy (3) Techniques, methods, and materials involved in college-level theory programs. Use of technology and review of existing software. Prereq: Consent of instructor.

593 Independent Study (1-15) See College of Arts and Sciences. Prereq: Consent of department head.

Music Voice

GRADUATE COURSES

410-20 Song Literature I, II (2,2) 410-German songs. 420-French, Italian, Russian, Scandinavian, Czechoslovakian, British, and American art songs. Graduate credit not available for students in vocal performance.

425 Functional Diction for Singers (3) Comprehensive survey of singing diction in six languages: French, English, German, Italian, Latin and Spanish. Basic instruction in International Phonetic Alphabet; development of basic diction skills; overview of diction styles and traditions in each language; survey of diction resources and reference materials. Does not fulfill deficiency requirements for graduate students in voice or accompanying.

490 Church Music Methods, K-12 (3) Development of child's voice through teenage years, vocal/choral techniques for various age groups through high school, choral literature for the youth church choir, non-vocal musical activities appropriate to various age groups as used in church music programs (e.g., Orff, handbells, rhythm activities, etc.)

510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 2 hrs.

520 Performance Techniques for Singers (1) Improvisation, movement, and basic techniques for dramatic vocal performance. Prereq: Vocal major or consent of instructor. May be repeated for credit. Maximum 2 hrs.

530 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

550-60 Advanced Vocal Pedagogy I, II (2,2) 550—Study of vocal production, examination of different methods. 560—Study of teaching materials, observation of studio teaching, analysis of vocal problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature I, II (2.2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document; recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR DEGREES

Nuclear Engineering ......................... M.S., Ph.D.

H. L. Dodds, Head

Professors:

Dodds, H. L., PE, Ph.D. ................... Tennessee

Kerlin, T. W. (Emeritus), Ph.D. ....... Tennessee

Miller, L. F., PE, Ph.D. .................. Texas A&M

Perez, R. B. (Emeritus), Ph.D. ............ Madrid

Stevens, P. N. (Emeritus), PE, Ph.D. ..

Uhrig, R. G. (Distinguished Prof.), PE, Ph.D. ....................... Idaho

Upadhyaya, B. R., Ph.D. ................... Iowa State

Assistant Professors:

Groer, P. G., Ph.D. ...................... Vienna

Hines, J. W., Ph.D. ....................... Ohio State

Povey, R. E., PE, Ph.D. ................... Tennessee

Ruggles, A. E., Ph.D. ..................... Rensselaer

Scott, T. H., PE, Ph.D. ..................... Florida

Research Professors:

Mihalczko, J. T., Ph.D. .................... Tennessee

Mynatt, F. R., Ph.D. ..................... Tennessee

Shannon, T. E., Ph.D. ..................... Tennessee

Research Assistant Professors:

Gribok, Adrei, Ph.D. ................. IPPE (Russia)

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 program focusing on fission energy or fusion energy, or a radiological engineering concentration, which prepares students for careers in the radiation safety field (health physics). Both programs are designed for graduates of accredited undergraduate programs in engineering, physics, chemistry, biology, or mathematics. 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 an introductory course in nuclear engineering. If such competencies do not exist, the student must take appropriate courses for undergraduate credit. In addition, students without a B.S. degree in nuclear engineering, or the equivalent, must take 431 (Radiation Protection) and 470 (Nuclear Reactor Theory I), both of which may be taken for graduate credit. The department head is the contact for all interested students, both those with nuclear engineering degrees and those from other disciplines. More detailed information about the Department of Nuclear Engineering is available on the web at http://www.engr.utk.edu/nuclear/

THE MASTER'S PROGRAM

A graduate program leading to the Master of Science degree is available to graduates of recognized undergraduate curricula as described above. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

The minimum requirements for the M.S. degree in nuclear engineering are:

1. A major consisting of 12 semester hours of graduate courses in nuclear engineering which must include at least one
of the following sequences: 511, 512; 521, 522; 551, 552; 571, 572; 581, 582.
2. A minor consisting of 6 semester hours of elective courses in mathematics, statistics or computer science.
3. Six semester hours in either nuclear engineering or a related field.
4. One of the following three options for a culminating experience:
   a. A thesis project (6 hours of 500).
   b. Two to four engineering practice projects (6 hours of 598).
   c. One engineering practice project (3 hours of 598) plus 6 hours of additional nuclear engineering coursework.
   Thus, options (a) and (b) result in a minimum total of 30 hours and option (c) results in a minimum total of 33 hours.
   The determination of which option a student may undertake is made by the student’s graduate committee and is based on the student’s personal interests, academic background, and work experience, as well as the nature of projects currently available in the department.
   A thesis project requires the student to conduct independent, in-depth research. An engineering practice project is similar to a thesis project but smaller in scope, and can be research, design, product development, special operations, or a critical review of published literature in a specific technical area. The student must submit a brief written proposal for each project undertaken, either thesis or engineering practice, which must be approved by the student’s graduate committee. The final report for an engineering practice project is normally prepared in thesis format (i.e., according to the UT Knoxville Guide to the Preparation of Theses and Dissertations); however, another formal report format may be used if approved by the student’s graduate committee. The student must also register for the appropriate number of hours of either 500 or 598, as specified by the student’s major professor, during each semester that work is performed on a thesis or engineering practice project. Finally, the student must pass an oral examination on all work presented for the degree—all coursework and the dissertation.

CERTIFICATE IN MAINTENANCE AND RELIABILITY ENGINEERING

The College of Engineering offers a certificate program in maintenance and reliability engineering. The program is designed primarily for part-time students in that all of the courses are available through distance education (see http://www.anywhere.tennessee.edu/ne/default.htm).

The 12-credit certificate is earned by completing 483 and 484, which are cross-listed among all participating departments in the College of Engineering, plus two elective courses selected from a list of courses provided by the participating departments. Currently, the available elective courses are Industrial Engineering 516 and 591, Mechanical Engineering 534 and 599, and Nuclear Engineering 579 and 585. The selection of elective courses is determined through an advising conference with each individual student, and is based on the student’s personal interests, academic background, and career objectives. Applicants must meet the minimum criteria established by the Graduate Council.

CERTIFICATE IN NUCLEAR CRITICALITY SAFETY

The Department of Nuclear Engineering offers a certificate program in nuclear criticality safety. The program is designed primarily for part-time students in that all of the courses are available through distance education (see http://www.anywhere.tennessee.edu/ne/default.htm).

The 12-credit certificate is earned by completing 421, 540 and 582 plus one of the following courses: 470, 571, or 581.

The selection of one of the latter three courses is determined through an advising conference with each individual student, and is based on the student’s personal interests, academic background, and work experience. Applicants must meet the minimum criteria established by the Graduate Council. Students without a nuclear engineering background must take 301 (Fundamentals of Nuclear and Radiological Engineering) prior to beginning the graduate coursework described above.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S. program in Nuclear Engineering is available to residents of the states of Arkansas, Mississippi, or South Carolina. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

400-level courses in nuclear engineering may be used for graduate credit. However, at least two-thirds of the minimum required hours in the M.S. program must be taken in courses numbered 500 or above.

GRADUATE COURSES

403 Nuclear and Radiological Engineering Laboratory II (3) Cross section measurements, diffusion properties of neutrons, shielding, dynamics and controls, alpha and beta spectroscopy, radiation fields and dosimetry. Prereq: Nuclear and Radiological Engineering Laboratory I.

404 Nuclear Fuel Cycle (3) Mining, milling, fabrication, in-core management, reprocessing, waste disposal, regulatory and radiological health issues and requirements. Prereq: 470 or equivalent.

406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; criticality accidents; safety standards; overview of experiments, computational methods, and applications. Prereq: 301 Fundamentals of Nuclear/Radiological Engineering.


432 Radiation Risk Analysis (3) Radiation risk estimates for external and internal radiation, dose-response models, dose rate effects, prediction of radia- tion risks, radiation safety standards.

470 Nuclear Reactor Theory I (3) Fundamentals of reactor physics relative to cross sections, kinematics of elastic scattering, reactor kinetics, reactor systems and nuclear data. Analytical and numerical methods applicable to general criticality problems, eigenvalue searches, perturbation theory, and multigroup diffusion equations. Prereq: 301 Fundamentals of Nuclear/Radiological Engineering.
Nuclear Reactor Theory II (3) Thermal spectrum computational methods: heterogeneous effects in fast and thermal spectra; considerations in reactor core design; equilibrium and non-equilibrium thermal and neutronic variables; power distribution calculations and reactivity control methods. Prereq: 470.

Introduction to Reliability Engineering (3) Probabilistic failure models, parameter estimation (maximum likelihood techniques), model identification and comparison, accelerated life tests, failure prediction, system reliability, preventive maintenance and warranties. Prereq: Senior standing or consent of instructor. (Same as Chemical Engineering 483, Industrial Engineering 483, and Mechanical Engineering 483.)

Introduction to Measurement Engineering (3) Principles of measurement (scales and units), measurement, and management maintenance. Information extraction from machinery measurements, rotating machinery diagnostics, nondestructive testing, life prediction, failure models, lubrication oil analysis, establishing predictive maintenance program, and computerized monitoring systems. Prereq: Senior standing in engineering and consent of instructor. (Same as Chemical Engineering 484, Industrial Engineering 484, Materials Science and Engineering 484, and Mechanical Engineering 484.)

Experimental Methods in Reactor Dynamics (3) Techniques for enrichment, fabrication, storage, reprocessing, and non-destructive testing. Prereq: 522 or equivalent.

Radiation Risk Analysis (3) Methods for radiation risk prediction, survival analysis, parameter estimation, real data analysis, extrapolation techniques. Prereq: 552 or consent of instructor.

Radiation Therapy I (3) Ionizing radiation use in radiation therapy to cause controlled biological effects in cancer patients. Physics of interaction of various radiation modalities with body equivalent materials and physical aspects of clinical applications. Lecture and lab. Prereq: Consent of instructor.

Radiation Therapy II (3) Physics of ionizing radiation therapy with emphasis on quality assurance, treatment planning, radiation protection, and special topics. Prereq: 522 or consent of instructor. (Same as Mechanical Engineering 576 and Engineering Science 576.)

Nuclear System Design (3) Design and analysis of a nuclear system, interface with non-nuclear aspects of system design; system reliability and economics; class project. Prereq: Consent of instructor.

Nuclear System Design (3) Application of expert systems in engineering: logic and rationale, developing expert systems, programming, advanced topics. Prereq: 576 or consent of instructor. (Same as Mechanical Engineering 576 and Engineering Science 576.)

Neural Networks in Engineering (3) Neural network technology for use in intelligent systems: learning, neural computing, structure of neural computing systems, programming. Prereq: Consent of instructor. (Same as Mechanical Engineering 577 and Engineering Science 577.)

Fuzzy Systems in Engineering (3) Fuzzy numbers, fuzzy environments, type 1 and type 2, fuzzy sets, fuzzy conditional statements, and approximate reasoning, fuzzy models and structures, decision process in fuzzy environment, fuzzy logic. Prereq: Consent of instructor. (Same as Mechanical Engineering 577 and Engineering Science 578.)

Advanced Monitoring and Diagnostic Techniques (3) Fundamentals of machinery monitoring and diagnostics; application of advanced statistical and artificial intelligence based techniques such as ridge regression, principal component analysis (PCA), linear and non-linear partial least squares (PLS), neural networks, and fuzzy logic. Prereq: Graduate standing or consent of instructor.

Reactor Shielding (3) Application of analytic/deterministic solutions of Boltzmann transport equation to shield design problems. Spherical harmonics, moments method, discrete ordinates, adjoint calculations, coupled analysis, and fast reactor shield design. Prereq: 406 or equivalent.

Monte Carlo Analysis (3) Analysis of radiation transport problems in radiation shielding by Monte Carlo method, use of MCNP code system. Random sampling, evaluation of integrals, analog particle transport, techniques of variance reduction, forward and adjoint modes of analysis, importance function biasing, streaming/weight window survival biasing and contribution theory. Prereq: Consent of instructor.

Process System Reliability and Safety (3) Qualitative and quantitative techniques for assessing and improving process systems reliability and safety. Fault tree analysis and associated dependent failure analysis. Prereq: Consent of instructor. (Same as Chemical Engineering 588.)

Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department.
THE MASTER'S PROGRAM

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, family nurse practitioner, mental health nursing, nurse anesthesia, nursing administration, and nursing of women and children. The program is accredited by the National League for Nursing Accrediting Commission and is unconditionally approved by the Tennessee Board of Nursing.

The purpose of the Master's program in nursing is to prepare leaders, managers, and practitioners who facilitate achievement of optimal health in the dynamic health care system. The program prepares advanced practice nurses for a career in adult health nursing, nursing of women and children, mental health nursing, and nurse anesthesia as well as role preparation as nurse practitioners, clinical nurse specialists or nursing administrators. Advanced practice nursing involves the delivery of care, management of resources, interdisciplinary collaboration, and application of technology, information systems, knowledge, and critical thinking.

Admission Requirements

1. Meet requirements for admission to graduate study.
2. Achieve a score of 500 or above on the verbal and on the quantitative portions of the Graduate Record Examination.
3. Achieve a TOEFL score of 550 or above if native language is not English.
4. Applicants for nurse anesthesia require an interview.
5. Hold a Bachelor's degree in Nursing (BSN) from an accredited program.
   a. Have a cumulative undergraduate GPA of 3.0 or higher on a 4-point scale or a GPA of 3.3 for courses in the undergraduate major.
   b. Have completed a health assessment and physiology course within the past five years.
   c. Have completed 3 hours of graduate level statistics.
   OR
   Hold a bachelor's degree in a discipline other than nursing (master's entry student or RN) from an accredited college or university.
   a. Have a cumulative undergraduate GPA of at least 3.0 on a 4-point scale.
   b. Have satisfactorily completed the following prerequisite courses: chemistry (8 hrs); microbiology (including lab); anatomy and physiology (6-8 hrs); nutrition (covering lifespan in health and illness); behavioral sciences (12 hrs in sociology, anthropology, growth and development, and at least one general psychology course); undergraduate research course or equivalent; 3 hours of graduate level statistics prior to enrollment in graduate research course.
   c. This option not available to nurse anesthesia or nurse administration students.
6. New students normally are admitted to the program only at the beginning of fall semester. However, under special circumstances and on a space available basis, a B.S.N. graduate may be admitted at the beginning of spring or summer terms in a temporary non-degree status. Applications from full-time BSN and master's entry students for fall admission must be received by February 1. Part-time and post-master's applications must be received by October 1.

Special Requirements

1. Each student must hold personal professional liability insurance.
2. Registered nurses must be licensed to practice nursing in Tennessee.
3. Each student must present proof of hepatitis B vaccination and rubella and rubeola immunization or sufficient titer for immunity; TB status.
4. Each student must present evidence of current 2-person CPR certification.
5. Non-registered nurse students must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 semester hours of behavioral science courses.
6. Contact student services for more detailed information about the application process: Student Services/MSN Program, UT College of Nursing, 1200 Volunteer Blvd., Knoxville, TN 37996-4180; phone: 865 974-7606.

Thesis and Non-Thesis Options

The thesis option is available for interest-ed 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 582 Scholarly Inquiry for Advanced Practice Nursing.

Program Requirements

All students must complete a minimum of 36 semester hours distributed as follows:

Core (9 credits)

503 Health Promotion in Advanced Practice Nursing 3
510 Theoretical Foundations of Nursing 3
520 Advanced Practice Nursing and Health Delivery Systems 3

Advanced Practice Core (9 credits)

504 Advanced Health/Physical Assessment 3
505 Advanced Clinical Pharmacology 3
515 Advanced Pathophysiology for Nursing Practice (not required for nurse anesthesia students) 3

Advanced Practice Core (9 credits)†

506 Advanced Anesthesia Pharmacology 3
516 Advanced Pathophysiology: Neurological and Cardiovascular with Anesthesia Implications 2
517 Advanced Pathophysiology: Respiratory/Reina with Anesthesia Implications 2
518 Advanced Pathophysiology: Obstetrics/Regional Anesthesia 2
521 Basics of Nurse Anesthesia 6
522 Integrated Health Science for Anesthesia 3
523 Advanced Principles of Nurse Anesthesia Practice 2

Research (6-9 credits)

501 Nursing Research: Methods, Design & Analysis 3
500 Thesis 6

Elective (9 credits)—Required for students in nursing administration concentration only.

*Not required for nursing administration concentration.

Students who enter the program as non-RNs must complete the following undergraduate courses in addition to meeting the requirements listed above:

311 Foundations of Professional Nursing Practice 5
319 Pathophysiology of Health Deviations 4
333 Health Assessment 3
341 Health Promotion 3
351 Pharmacology 1 2
361 Health Maintenance & Restoration across the Life Span 5
381 Professional Leadership Issues I 2
382 Health Promotion & Maintenance in the Community 4
406 Pharmacology II 2
415 Family/Community Health Nursing 6
421 Health Maintenance & Restoration in Mental Health 4
451 Professional Leadership Issues II 2
461 Health Restoration across the Life Span 5
482 Health Promotion, Maintenance & Restoration in the Community 4

Registered nurses whose bachelor's degrees are not in nursing must have completed courses in chemistry, nutrition, microbiology, anatomy, and physiology plus 12 hours of behavioral science courses. They must also complete 305, 382, 452, 482 and 490 and complete or successfully challenge the following:

311 Foundations of Professional Nursing Practice 5
319 Pathophysiology of Health Deviations 4
333 Health Assessment 3
351 Pharmacology I 2
361 Health Maintenance & Restoration across the Life Span 5
403 Health Promotion & Maintenance in Childbearing Families 5
406 Pharmacology II 2
421 Health Maintenance & Restoration in Mental Health 4
451 Professional Leadership Issues II 2
461 Health Restoration across the Life Span 5

A total of 19 credits can be obtained by successful completion of the NLN ACE Examination. See undergraduate catalog for other challenge options. RNs who are in the process of completing a BSN at UT with the intent of enrolling in the MSN program follow the same plan with the addition of 417.
Final Examination Requirements

All students must successfully complete a final examination as required by the Graduate Council. 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, and expand the theoretical basis of nursing.
2. Conduct research that generates knowledge and advances nursing as a discipline.
3. Provide leadership as nurse scientists who can function in a variety of roles and settings.
4. Collaborate with members of other disciplines in health-related research.
5. Develop, implement, evaluate, and recommend health care policy.
6. Demonstrate professionalism, advocacy, ethical principles and scientific integrity.

Admission Requirements

1. Meet requirements for admission to graduate study.
2. Hold a master’s degree in nursing from a program accredited by the National League for Nursing. Some outstanding applicants who are preparing 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 graduate grade-point average of 3.3 on a 4.0 scale for previous college work.
4. Have a combined 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 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 Office of Graduate Admissions. Submit three Graduate Rating Forms, sample of scholarly writing, and Graduate Program Data Form with essay to the Director of the PhD program prior to November 1 of the year prior to fall admission.
12. Schedule a personal interview with the College of Nursing PhD Student Admissions Committee prior to March 15 of the year preceding Fall admission. International applicants may be interviewed by telephone or teleconferencing at the discretion of the admissions committee.

Program Requirements

The following courses are required for all students:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>601</td>
<td>Nursing Knowledge Development</td>
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<tr>
<td>602</td>
<td>Theory Analysis &amp; Construction</td>
<td>3</td>
</tr>
<tr>
<td>603</td>
<td>Nursing Research and Inquiry</td>
<td>3</td>
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<tr>
<td>605</td>
<td>Middle-Range Theoretical Formulations for Nursing Science Development</td>
<td>3</td>
</tr>
<tr>
<td>606</td>
<td>Nursing Research Seminar</td>
<td>3</td>
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<tr>
<td>607</td>
<td>Qualitative Nursing Research</td>
<td>3</td>
</tr>
<tr>
<td>608</td>
<td>Quantitative Nursing Research</td>
<td>3</td>
</tr>
<tr>
<td>609</td>
<td>Research Practicum*</td>
<td>2</td>
</tr>
<tr>
<td>610</td>
<td>Nursing Science Seminar</td>
<td>2</td>
</tr>
<tr>
<td>611</td>
<td>Advanced Nursing Seminar</td>
<td>2</td>
</tr>
<tr>
<td>612</td>
<td>Health and Nursing Policy/Planning</td>
<td>3</td>
</tr>
<tr>
<td>613</td>
<td>Nursing Leadership in Complex Systems</td>
<td>3</td>
</tr>
<tr>
<td>---</td>
<td>Inferential Statistics</td>
<td>3</td>
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<tr>
<td>---</td>
<td>Multivariate Statistics</td>
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<td>---</td>
<td>Cognates</td>
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<tr>
<td>---</td>
<td>Elective</td>
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<tr>
<td>600</td>
<td>Dissertation</td>
<td>24</td>
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<td>TOTAL</td>
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<td>72</td>
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</tbody>
</table>

*Note: 1 hour per semester must be taken for 2 semesters.

Possible cognate areas include, but are not limited to, anthropology, child and family studies, psychology, education, management, medical ethics, public health, social work, philosophy, and statistics.

Doctoral Committee

Early in the student’s program, a nursing faculty advisor will be selected by the student in consultation with the program director. The student’s comprehensive examination committee consists of the faculty teaching core courses and one representa-
GRADUATE COURSES

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

501 Nursing Research: Methods, Design, and Analysis (3) Basic principles of research process in application to professional situations; critical evaluation of nursing and health-related research. Prereq or coreq: Graduate level statistics. E

502 Registration for Use of Facilities (1-15) E

503 Health Promotion in Advanced Practice Nursing (3) Principles of health promotion, education, and innovative strategies for achieving wellness of individuals, families, groups, and communities. Prereq: Admission to MSN program or consent of instructor.

504 Advanced Health/Physical Assessment (3) Development of advanced clinical reasoning and assessment skills to determine client health status and needs. Application of physiological, pathophysiological, and psychosocial concepts with implications for advanced practice nursing. Prereq: Admission to MSN program or consent of instructor. Didactic (2.5) and lab (0.5).

505 Advanced Clinical Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems. Biologic/clinical actions of medications, side and interactive effects of commonly prescribed drugs. Prereq: Undergraduate pharmacology course or consent of instructor. F


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

510 Theoretical Foundations of Nursing (3) Historical evolution of nursing science; nursing’s metaparadigm and selected philosophies, conceptual models and theories as structures which guide critical thinking in analysis, reasoning, and decision making for advanced practice. Prereq: Admission to MSN program or consent of instructor. F

511 Statistical Applications to Nursing Research (3) Descriptive and inferential statistics: statistical concepts and applications to clinical settings and their applications to advanced practice nursing.

515 Advanced Pathophysiology for Nursing Practice (3) Advanced physiologic and pathophysiologic concepts, principles, and theories applied to deviations of human systems. Prereq: Undergraduate pathophysiology course. Sp

516 Advanced Pathophysiology: Neurological/Cardiovascular with Anesthesia Implications (2) Review of anatomy and physiology integration of pathophysiology involved in patients requiring anesthetic care for cardiac, surgical procedures (both children and adults) with and without cardiopulmonary bypass, intercranial surgical procedures for vascular aneurysms, and brain lesions, patients requiring somatosensory evoked potential monitoring, and patients requiring anesthesia for noncardiac and non-neurological procedures who present with either neurological and/or cardiovascular comorbidity. Prereq: 521, Coreq: 523.


518 Advanced Pathophysiology: Obstetrics/Regional Anesthesia (2) Review of anatomy and physiology and integration of pathophysiology involved in administration of regional anesthesia and lower extremities. Local anesthetic pharmacology, indication for regional anesthesia, contraindications to specific blocks, and techniques for clinical administration of regional blocks and their applications to obstetric and other surgical anesthesia considerations for obstetric patient. Prereq: 521, Coreq: 523.

520 Advanced Practice Nursing and Health Delivery Systems (3) Nursing’s role in dynamic health care system: health policy and organizational, social, ethical, political, economic, and technological factors which impact advanced practice nursing and delivery of health care. Prereq: Admission to MSN program or consent of instructor.


522 Integrated Health Science for Anesthesia (3) Fundamental principles of chemistry and physics as related to the practice of anesthesia. Correlation of these principles to clinical anesthesia practice. Prereq or coreq: 521.


530 Adult Health Nursing I (6) Advanced nursing practice for health promotion, restoration, and maintenance of young, middle-aged, and older adults. Theories and research to advanced practice with individual and group clients in variety of settings. Prereq: 504, 505, 515. Prereq or coreq: 503, 510, 520. Didactic (2) and practicum (4). Sp

531 Adult Health Nursing II (6) Continuation of 530. Delivery, provision, and management of health care for adult groups and communities. Prereq: 530, 501. Prereq or coreq: 582, 583 (gerontology students only). Didactic (2) and practicum (4). F


550 Nursing of Women and Children I (6) Advanced practice nursing for women and children; clinical experience in role of nurse practitioner or clinical nurse specialist in variety of settings. Health promotion and nursing interventions for actual or potential health problems of women, children, and families. Prereq: 504, 505, 515. Prereq or coreq: 503, 510, 520. Didactic (3) and practicum (5). Sp

551 Nursing of Women and Children II (6) Continuation of 550. Role refinement of nurse practitioner or clinical specialist in health maintenance and restoration for women, children, and families. Prereq: 550, 501. Prereq or coreq: 582. Didactic (3) and practicum (5). F

552 Parent Child Nursing Field Work and Seminar (3) Seminar and intensive clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced parent-child nursing practice. Prereq or coreq: 551, 1 hr and 4 labs.

557 Nurse Midwifery Seminar I (1) Exploration of art and science of midwifery, nature and scope of midwifery practice, professional and ethical issues in advanced nursing practice. Prereq or coreq: 501, 510. F

558 Nurse Midwifery Seminar II (1) Exploration of psychological, developmental, and sociocultural theories as related to individual and family patterns of illness and wellness. Midwifery in advanced practice promoting optimal wellness within clients and community. Prereq: 501, 510, 570. Coreq: 520. Sp
593 Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Nursing Knowledge Development (3) Philosophical and historical context of knowledge for nursing science; examining models and theories as frameworks for knowledge building; concept development in theory building. F
602 Theory Analysis and Construction (3) Analysis of existing theories of person, environment, health, nursing, and caring. Prerequisites or practical experience in process of nursing theory development. Prereq: 601, 610, or consent of instructor. Sp
606 Nursing Research Seminar (3) Selected topics pertaining to dissertation/proposal research, research experience, and defense. Sp
607 Qualitative Nursing Research (3) Critique and application of qualitative nursing research methods. Prereq: 601, 602, 603. Su
608 Quantitative Nursing Research (3) Critique and application of quantitative nursing research methods. Prereq: 601, 602, 603, inferential statistics. Prereq or coreq: Multivariate statistics. F
609 Research Practicum (1-3) Supervised individual or group research experience under guidance of faculty. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC or letter grade. E
610 Nursing Science Seminar (2) Critical Analysis and synthesis of literature in selected focus area within nursing science. Prereq: Admission to doctoral program in nursing or consent of instructor. F
611 Advanced Nursing Seminar (2) Exploration of historical and current issues of interest to doctoral prepared nurses. F
612 Health and Nursing Policy/Planning (3) Policies affecting nursing education and practice; health policies and political processes; interactions between health professionals, consumer groups, and government in health policy development and health planning activities. Sp
613 Nursing Leadership in Complex Systems (3) Analysis of the role of nursing leadership in management in complex professional, academic, and health care systems. F
614 Nursing Preceptorship (3) Individually-designed practicum, field, or internship experiences in variety of administrative, educational, research, or clinical practice settings. Prereq: 601, 602, F, Su

Nutrition

(College of Human Ecology)

MAJORS
Nutrition ......................... Ph.D.

DEGREES
Human Ecology ..................... M.S., M.S.-M.P.H.

Michael B. Zenel, Head

Professors:
Beachene, Roy E. (Emeritus), Ph.D. ................. Kansas State
Carruth, Betty R. (Emeritus), Ph.D. .......... \nNamey, T. C., M.D. .............. Washington (St. Louis)
Sachan, Dileep S., Ph.D. ............... Illinois
Skinner, Jean D., Ph.D. .............. Oregon State
Whelan, Jay, Ph.D. ................. Penn State

Zemel, Michael (Laiso), Ph.D. .............. Wisconsin

Associate Professors:
Bailey, James W., Ph.D. .............. Iowa State
Burney, Janie, Ph.D. ................. Tennessee
Greer, Betty P., M.A. .............. Tennessee
Haughton, B., Ed.D. ............... Columbia
Karlstad, Michael, Ph.D. ......... Loyola
Moussa, Naima, Ph.D. .............. Paris

Assistant Professors:
Bittle, Joyce (Memphis), Ph.D. ............. Memphis
Chencharich, Judith (Memphis), Ed.D. ............... Memphis
Kim, Jung-Han, Ph.D. ................. Tennessee
Truett, Gary, Ph.D. .......... Georgia

The Master of Science program is available in Nutrition, with a concentration in nutrition science or public health nutrition. A graduate degree combined with a Dietetic Internship (D.I.) beyond the baccalaureate degree prepares the graduate to apply for the Registration Examination to become a Registered Dietitian (R.D.). Students may request more information from the department about the D.I. program. The Dietetic Internship is currently granted accreditation by the Commission on Accreditation for Dietetics Education of The American Dietetic Association, 216 W. Jackson Blvd., Chicago, IL 60606-6995, Tel: 312 899-5400. Students may also select an interdisciplinary minor in gerontology.

ADMISSION REQUIREMENTS

A complete file for review includes the Graduate Application for Admission file, completed departmental application form, Graduate Record Exam (GRE) scores for the general section, and three Graduate Rating Forms completed by individuals who can attest to the applicant’s potential for graduate education. Forms may be obtained from the Department, 229 Jessie Harris Building, University of Tennessee, Knoxville, 37996-1900. Forms may also be obtained from the Department’s website at http://nutrition.ote.uk.edu/.

Admission into the graduate program in the department is dependent on completion of the prerequisite lower division undergraduate courses in Nutrition Science. Six necessary background for success in the graduate program. Required undergraduate courses include: general and organic chemistry, physiological chemistry/biochemistry, physiology, statistics and advanced nutrition. Admission to the Ph.D. program in Human Ecology with a concentration in Nutrition Science requires a master’s degree. Applicants to all programs with related experience may be given preference.

THE MASTER’S PROGRAM

Students may choose a thesis or non-thesis option in Nutrition. Attendance at Nutrition 540 is required every semester.

Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of coursework in the department. NTR 511, 512, 540, 541 and 3 hours of graduate level statistics are required. Students in public health nutrition must take 511, 512, 513, 514, 515 and the three hours of Statistics. Six hours of Thesis 500, and 6 hours outside the
DUAL M.S.-M.P.H. PROGRAM

The College of Human Ecology offers a coordinated dual program leading to the conferred dual degrees, as well as the requirements for the M.S. and M.P.H. programs.

Admission Requirements

Applicants for the M.S.-M.P.H. program must make separate application to, and be competitively and independently accepted by, both departments. Such approval will be granted, provided that dual program studies be started concurrently and independently accepted by, both departments may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both departments. Any letter-graded 500-level or above nutrition courses to be counted toward the M.S. and M.P.H. degrees, as well as the requirements for the dual program. A minimum of 11 semester hours of credit toward the M.P.H. degree for successful completion of approved courses offered in the Department of Nutrition. All courses for which such cross-credit is awarded must be approved by the Public Health Academic program Committee and the student’s graduate committee. A single block field experience (or public health internship) is required of all students and the analytical field paper incorporates public health nutrition and the student’s public health concentration. Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward the M.S. or M.P.H. degree for courses taken in the other program, except as such courses qualify for credit without regard to the dual program.

Approved Dual Credit

M.S. courses to be counted toward the M.P.H. program must include 10 semester hours of Field Study in Community Nutrition (NTR 515) and 1 semester hour of Graduate Seminar in Public Health (NTR 509); M.P.H. courses to be counted toward the M.S. include Public Health Administration (PH 520), Biostatistics (PH 530), and Epidemiology (PH 540).

THE PH.D. CONCENTRATION

The nutrition science concentration enables students to study the science of nutrition from the cellular level to the application of nutritional principles by people in a changing environment.

The doctoral program emphasizes cellular/molecular nutrition, human nutrition, nutritional epidemiology, and experimental nutrition. Cognate areas may include anthropology, biochemistry, chemistry, communications, education, food technology, human development, physiology, public health, sociology, statistics, and/or toxicology.

Minimum requirements include:
1. Sixteen hours in nutrition including 4 hours at the 600 level (exclusive of dissertation); 9
2. NTR 511, 512, 541, and 2 hours from either 542-544;
3. Four hours of NTR 540, attendance required every semester;
4. Six hours of statistics;
5. Six hours in a cognate area;
6. Nine hours at the 600 level;
7. Students without college teaching experience are required to take the fall semester teaching seminar for GTAs and NTR 548 comprising a faculty-supervised problem in college teaching.

MINOR IN NUTRITION

The graduate minor consists of Nutrition 511 and 512 plus at least three hours from any letter-graded 500-level or above nutrition courses.

GRADUATE COURSES

500 Thesis (1-15) P/NP only, E
502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only, E
508 Culture, Food, and Nutrition (3) Food-related behavior of individuals and groups in United States, Sociocultural, economic, and technological influences. Nutrition and public policy. Prereq: Advanced Nutrition or consent of instructor. F,A
509 Graduate Seminar in Public Health (1) Same as Public Health 509, Exercise Science 509, Nursing 509 and Social Work 509.
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 help processes; Prevention programs, 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 programs. Location of in-depth study to be selected in consultation with instructor. Prereq: 513, 514 and consent of instructor. S/NC only. Su
516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during preg- nancy, infancy, and childhood to age 5, high risk conditions. Prereq: Advanced Nutrition or consent of instructor. F
517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school age children; effects of diseases on growth and health maintenance; nutritional assessment and counseling for nutrition. Prereq: Advanced Nutrition or consent of instructor. Sp,A
518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; affects of nutrition on biological aging. Prereq: Advanced Nutrition or consent of instructor. Su
520 Nutritional Ecology (2) Examination of issues in natural, pastoral, physical, and social environments that impact availability of food and nutrients in U.S. food supply. F,A
521 Physiological Basis for Diet and Disease (3) Altered nutrient needs as result of metabolic changes that occur with aging. Prereq: Nutrition in Disease or consent of instructor. Sp
522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of counseling process. Prereq: Nutrition in Disease or consent of instructor. F,A
524 Nutrition Education: Principles, Implementation, and Evaluation (3) Conceptual models, principles, application, and evaluation models in nutrition education research. Prereq: 508 or consent of instructor. Su,A
530 Molecular Application in Nutrition-Genome Interaction (1) Theories and applications of gene regulation methodologies. Experimentation with DNA and RNA. RNA and DNA isolation, analysis, to illustrate nutrient regulation of gene expression. Combination of lab/lecture. S
540 Seminar in Nutrition (1) May be repeated. S/NC only. E
541 Research Methods (2) Basic principles of planning, conducting, and interpreting nutrition and foodservice systems research. Prereq: F, F. 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 approach. Prereq: 511, Sp
544 Survey Methods in Food and Nutrition (2) Application of survey research methods to nutrition projects: assessment of food consumption, nutrient
intake, nutritional status, sociocultural-economic parameters, food production and service. Prereq or coreq: S41. Sp

547 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. S/NC only. E

548 Directed Study in Nutrition (1-3) Advanced study in nutrition. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

549 Special Topics (1-3) Recent advances in nutrition or food systems administration. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Prereq: 512 or consent of instructor. May be repeated. F

603 Current Trends in Food and Sociocultural Change (2) Critical evaluation of research. Prereq: 508 or consent of instructor. F.A

THE DOCTORAL PROGRAM
Students must hold an M.A. with a major in Philosophy or an equivalent degree when entering the Ph.D. program. Thirty-three hours of coursework beyond the M.A. are required, of which 6 hours will be in courses numbered above 600. See the Philosophy Department Graduate Student Handbook for specific course requirements.

Students must demonstrate a reading knowledge of one foreign language, normally a living language in which there exists a significant body of philosophical literature. (In special circumstances relating to the area of dissertation research, the Graduate Committee may approve a language not satisfying these conditions.) This may be done by passing the doctoral language examination given by the appropriate department, if available, or by passing French 302 or German 332 with a B or better. Bi- or multilingual (normally, foreign) students, whose native language (other than English) is one in which there is a significant body of philosophical literature, are exempted from the foreign language requirement. Students receiving the Ph.D. with concentration in medical ethics are also exempted.

CONCENTRATIONS

Medical Ethics
The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Detailed information concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Director of the Medical Ethics Program.

Religious Studies
The department has an M.A. program of graduate study with a concentration in religious studies. Details concerning the program may be obtained from the Director of Graduate Studies in the Department of Religious Studies.
<table>
<thead>
<tr>
<th>PHYSICS AND ASTRONOMY</th>
<th>MAJOR DEGREES</th>
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<td>(College of Arts and Sciences)</td>
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**Soren Sorensen, Head**

**Professors:**

<table>
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<tr>
<th>Name</th>
<th>Department</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes, F. E.</td>
<td>Physics</td>
<td>California</td>
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<tr>
<td>Bingham, C. R.</td>
<td>Physics</td>
<td>Tennessee</td>
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<tr>
<td>Blass, W. E.</td>
<td>Physics</td>
<td>Michigan State</td>
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<tr>
<td>Breining, M.</td>
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<td>Oregon</td>
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<td>Bugg, W. M.</td>
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<tr>
<td>Calcott, T. A.</td>
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<td>Childers, R. W.</td>
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<tr>
<td>Crater, H. W.</td>
<td>Physics</td>
<td>Yale</td>
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<td>Egiluz, A. G.</td>
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<td>Elston, S. B.</td>
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<td>Georgiou, S. P.</td>
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<td>Handler, T.</td>
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<td>Kamyshkov, I.</td>
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<tr>
<td>Lewis, J. W.</td>
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<td>(Distinguished Prof.) (UTSI), Ph.D.</td>
</tr>
<tr>
<td>Macek, J.</td>
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<td>Mississippi</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>(Distinguished Scientist)</td>
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<tr>
<td>Rensselear</td>
<td>Mahan, G. D.</td>
<td>California</td>
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<tr>
<td>Ph.D.</td>
<td>Nazarewicz, W.</td>
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<td>Painter, L. R.</td>
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<td>Pegg, D. J.</td>
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<tr>
<td>Plummer, E. W.</td>
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<td>(Distinguished Scientist), Ph.D.</td>
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<tr>
<td>Quinn, J. J.</td>
<td>Physics</td>
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<tr>
<td>(Willis Lincoln Chair of Excellence)</td>
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<td>Riedinger, L. L.</td>
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<td>Shih, C. C.</td>
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<td>(Liaison), Ph.D.</td>
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<td>Soerensten, S. P.</td>
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<td>Strayer, M. R.</td>
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<td>Thompson, J. R.</td>
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<td>Ward, B. F.</td>
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<tr>
<td>Weitinger, H. H.</td>
<td>Physics</td>
<td>Groningen (Netherlands)</td>
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**Associate Professors:**

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<th>Name</th>
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<tr>
<td>Dai, P.</td>
<td>Physics</td>
<td>Missouri</td>
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<tr>
<td>Davis, L.</td>
<td>(UTSI), Ph.D.</td>
<td>Auckland</td>
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<tr>
<td>Ferrell, T. L.</td>
<td>Physical</td>
<td>Clemson</td>
</tr>
<tr>
<td>Levin, J. C.</td>
<td>Physics</td>
<td>Oregon</td>
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<tr>
<td>Mandrus, D. G.</td>
<td>Physical</td>
<td>SUNY (Stony Brook)</td>
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<tr>
<td>Parigger, C. (UTSI)</td>
<td>Physics</td>
<td>New Zealand</td>
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<tr>
<td>Read, K. F.</td>
<td>Physics</td>
<td>Cornell</td>
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<tr>
<td>Shieh, S. Y.</td>
<td>Physics</td>
<td>Maryland</td>
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<tr>
<td>Siopsis, G. Ph.</td>
<td>Physics</td>
<td>Cal Tech</td>
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**Assistant Professors:**

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<tbody>
<tr>
<td>Daunt, S. J.</td>
<td>Physics</td>
<td>Queens</td>
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<tr>
<td>Dean, D. J.</td>
<td>Physics</td>
<td>Vanderbilt</td>
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<tr>
<td>Sanders, A. J.</td>
<td>Physics</td>
<td>Tufts</td>
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<tr>
<td>Pinnaduwage, L. A.</td>
<td>Physics</td>
<td>Pittsburgh</td>
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<tr>
<td>Thonnard, N.</td>
<td>Physics</td>
<td>Kentucky</td>
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<tr>
<td>Zhang, J. Y.</td>
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<td>Lanzhou</td>
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**Research Associate Professor:**

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<tbody>
<tr>
<td>Datskos, P.E.</td>
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**Research Assistant Professors:**

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<tr>
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<th>Location</th>
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<tbody>
<tr>
<td>Efremenko, Y. Y.</td>
<td>Physics</td>
<td>ITEP (Russia)</td>
</tr>
<tr>
<td>Yost, S. A.</td>
<td>Physics</td>
<td>Princeton</td>
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Graduate programs leading to the Master of Science and Doctor of Philosophy are offered in a number of concentration areas: astrophysics; atomic, molecular, optical, and low temperature physics; biophysics; chemical physics; condensed matter and surface physics; elementary particle physics; geophysics (Master’s only); health physics (Master’s only); mathematical and computational physics; nuclear and relativistic heavy ion physics; and theoretical physics.

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 laser applications, quantum and applied optics, laser spectroscopy, fluid physics, medical physics, computational physics, and theoretical physics. For additional information, contact the department head.

**ADMISSION REQUIREMENTS**

A student who enrolls in graduate study with the intention of attaining an advanced degree in Physics will have completed an undergraduate major in Physics or its equivalent. Physics 311-12, 321, 361, 431-32, 421, 461, and 411-12 constitute the minimum courses prerequisite to graduate study.

A student who intends to present Physics as a graduate minor will have completed an undergraduate minor in Physics or its equivalent. Physics 311 and 431-32 constitute the minimum coursework prerequisite to a minor in Physics. In addition to meeting the Graduate Council’s minimum requirements, applicants are strongly encouraged to submit scores from the Graduate Record Examination (general and subject).

All first-year graduate students are required, for advising purposes only, to take a diagnostic examination in undergraduate physics during the fall semester registration period.

**THE MASTER’S PROGRAM**

**Thesis Option**

The course requirements include 24 semester hours of physics courses, of which at least 12 hours are taken from Physics 511-12 or 513-14, 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.

The department offers an M.S. thesis program with a concentration in geophysics. Program requirements are: 12 hours from Physics 513-14, 531-32, 541-42, 571-72; a minimum of 12 additional hours in geology, geophysics, and/or physics, as approved by the student’s committee; and the presentation of an acceptable thesis, 6 hours of Physics 500, and the passing of an oral examination on course material and thesis.
Project Option

The course requirements include a minimum of 30 semester hours of graduate credit in courses composed of Physics 506, 511-12; 6 hours from Physics 593, 594 for a Project in Lieu of Thesis; 9 hours from general physics: 411-12, 421, 431-32, 461-62, 507, 508, 521-522, 531-32, 541-42, 555, 571-72 (at least 3 hours above the 500 level); and 6 hours from a single minor field outside of the physics department, such as computer science, mathematics, engineering, chemistry, biology, education, business, or law.

The candidate must pass an oral examination on course material and on the Project representing the culmination of an original research project completed by the student. A written report must be approved and accepted by the Physics Graduate Committee and the Department Head. An electronic version of the written report must also be submitted to the permanent electronic archive of the Physics Department available to the Internet.

Non-Thesis Option

Students seeking the non-thesis option must apply to the department’s graduate committee for permission to enroll under this program. The requirements are the satisfactory completion of 36 semester hours of coursework composed of 18 hours from Physics 511-12 or 513-14, 521-22, 531-32, 541-42, and 571-72; 6 hours in a minor field; and 6 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 the graduate core curriculum in physics consisting of the following courses: Physics 521-22, 531, 541, 551, and 571. Students concentrating in chemical physics may substitute Chemistry 572 for Physics 551, and should complete at least 6 semester hours from Chemistry 570, 571, 670. Students must take a minimum of 15 hours of 600-level courses, with 6 of these hours in their concentration area. Physics 601-02 are normally required of students concentrating in atomic physics; Physics 621-22 of students in nuclear physics; Physics 626-27 of students in elementary particle physics (and/or Physics 613-14 for students concentrating in theoretical physics); and Physics 671-72 of students in condensed matter and surface physics.

To be admitted to Ph.D. candidacy students must: a) fulfill all general requirements by the Graduate Council, b) pass the qualifying examination, c) have at least a 3.0 GPA on the graduate core curriculum in physics, d) complete the command of the language typically included in the undergraduate physics major curriculum. The qualifying examination should be passed after the student’s first year of study. Based on the student’s performance on a) the qualifying examinations, b) the coursework, c) the GRE scores and d) optional research participation, the faculty will decide if the student will be allowed to continue in the Ph.D. program.

Students are required to find a research advisor and form a doctoral committee before the end of the second year of study. This committee is responsible for advising the student and monitoring his/her progress toward the doctoral degree.

The comprehensive examination is designed to test the student on a) specific knowledge and skills in the areas essential to the student’s research program, b) capability to successfully complete the doctoral dissertation and c) general knowledge of the graduate core curriculum. The most essential component of this examination is the presentation and defense of an original research proposal. The comprehensive examination must be passed before the end of the third year of study. It contains both a written and an oral component and is conducted by the student’s doctoral committee and an additional faculty member appointed by the department head.

The dissertation topic will be chosen with reference to one of the fields in which research facilities can be made available either at The University of Tennessee laboratories in Knoxville; The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak Ridge National Laboratory, Oak Ridge, Tennessee; or at other research facilities used by the University faculty.

Astronomy

GRADUATE COURSES

411 Astrophysics (3) Development of analytical physical models of galactic structure of universe, stellar and interstellar matter, and planetary systems. Topical and interdisciplinary, consideration of quasars, pulsars, black holes and current developments in field. Acceptable for major credit in physics. Prerequisite: Physics 336 Introduction to Physics for Physical Science and Mathematics Majors, or 136 Honors Fundamentals of Physics: Wave Motion, Optics, and Modern Physics, and consent of instructor.

490 Special Topics in Astronomy (1-3) Topics of current interest in astronomy and astrophysics. Acceptable for graduate credit in physics with consent of department. May be repeated with consent of department. Maximum 6 hrs.

Physics

GRADUATE COURSES

411-12 Introduction to Quantum Mechanics (3,3) Fundamental principles of quantum mechanics and applications to various nuclei, atoms, solids, and condensed matter. The text is to be determined in consultation with the advisor. Prerequisite: 431 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. Prerequisite: 431 or Introduction to Physics for Physical Science and Mathematics Majors or Honors: Fundamentals of Physics for Physics Majors or Fundamentals of Physics: Wave Motion, Optics, and Modern Physics and consent of instructor. 3 hrs and 3 labs.


461-62 Modern Physics Laboratory (3,3) 461 - Introduction to fundamental 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. Prerequisite: Electronics Laboratory or 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. Prerequisite: 461. 6 hrs lab per week.

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

503 Physics Colloquium (1) Lectures and discussion on current research topics. Continuous registration required for current graduate physics majors. May be repeated. Maximum 6 hrs. S/N/C only. E

505 Physics of Fluids (3) Fluid physics, overview of fluid mechanics and associated computational techniques; general description of laminar and turbulent flows; subsonic, supersonic and hypersonic flows; continuum, transitional and free-molecular flows; pipe flow, nozzle flow and sonic orifice expansion flows; reacting and nonequilibrium flows; shock-tube physics; and introduction to method of characteristics and Monte Carlo computational techniques.

506 Experimental Methods (3) Principles, real operational behavior, and hazards of laser types, radiation detection, photomultiplier detectors, image intensifiers, image converters, image dissector, streak cameras, and fast-framing cameras; high-vacuum systems including cryogenic-based devices, data acquisition and fast-framing cameras; high-vacuum systems instrumentation, Fourier optics, and spectroscopy and techniques including synchronous detection, digital electronics methods and micro-computer data acquisition and registration methods.

507 Contemporary Optics (3) Topics in geometrical, physical, Fourier, and nonlinear optics and introductory laser physics. Extensive use of computer calculations and design of practical and sophisticated optical systems.

508 Laser Physics (3) Mode analysis, stable and unstable resonators; rate equations and population inversion, saturation, relaxation oscillations, fluctuations and noise, laser stability; quantum theory of laser, photon coherence; mode-locking, Q-switching and frequency stabilization, specialized laser types, semiconductor and solid-state, excimer, copper vapor and dye lasers.

511-12 Theoretical Physics (3,3) Concepts and applications of physics, including quantum mechanics, relativity, complex variables, quantum field theory, general relativity, gravitation, quantum electrodynamics, thermodynamics, statistical mechanics and magneto-static problems, EM waves, duality and gauge theory, superfluids, superconductivity, quantum information, and hazards of laser types, radiation detection, photomultiplier detectors, image intensifiers, image converters, image dissector, streak cameras, and fast-framing cameras; high-vacuum systems instrumentation, Fourier optics, and spectroscopy and techniques including synchronous detection, digital electronics methods and micro-computer data acquisition and registration methods.

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513 Problems in Theoretical Physics I (3) Fundamentals of physics: classical mechanics (Newtonian mechanics, Lagrangian and Hamiltonian dynamics) and electrostatics and magnetostatics.

514 Problems in Theoretical Physics II (3) Fundamentals of physics: electrodynamics, relativity, and quantum mechanics.

521-22 Quantum Mechanics (3,3) Fundamental principles of quantum mechanics, angular momentum, electron spin, particles in electric and magnetic fields, perturbation theory, variational methods, scattering theory; second quantization, quantization of electro-magnetic field, emission, absorption, and scattering of light, bra and ket creation and annihilation. Application of quantum mechanics to problems of atomic, molecular, nuclear, and solid state physics. Prereq for 521: 522.

531 Classical Mechanics (3) Variational formulation, Lagrange's and Hamilton's equations, constraints, canonical transformations, Hamilton-Jacobi theory and action-angle variables.

532 Advanced Classical Mechanics (3) Advanced topics in classical mechanics, KAM theorem and Hamiltonian chaos. Topics may vary according to interest of students and instructor. Prereq: 531.

541-42 Electromagnetic Theory (3,3) 541—Review of electrostatics, magnetostatics, and quasi-static problems; Maxwell's equations and their solutions in dielectric and conducting media; electromodynamics and relativity, retarded potentials and gauge transformations; radiation; plane waves and coordinate transformations. 542—Advanced treatment of Electrodynamics, collisions between charged particles, bremsstrahlung, multipole fields. Topics may vary according to interest of students and instructor. Prereq or coreq for 541: 571. Prereq for 542: 541.


555 Solid State Physics (3) Elementary solid state physics. Crystal structures, reciprocal lattice, bonding in solids, energy bands, semiconductors, phonons, free-electron gas theory of metals, superconductivity, magnetism, and other forms of broken symmetry. Prereq: 522 or consent of instructor.

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: 531 and 542.


601-02 Atomic Physics (3,3) 601—Survey of research problems and methods. Topics of current interest. Intended for all graduate students. 602—Advanced problems for students specializing in field.

605 Laser Spectroscopy (3) Applications of lasers to spectroscopy of atomic, molecular and solid state physics. Absorption, laser-induced fluorescence, and Raman spectroscopy; molecular and atomic coherence, quantum beats, resonant fluorescence, photon echoes, self-induced transparency; saturation and Doppler-free spectroscopy; laser cooling and trapping. Prereq: 521, 541.

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 microwave processes, four-wave mixing and phase conjugation, transient coherent optical effects and free induction decay, optical breakdown and nonlinear effects in plasmas. Prereq: 522.

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 coherence; atomic scattering phenomena. Prereq: 521.

611 Advanced Quantum Mechanics and Field Theory (3) Survey of problems and methods. Topics of current interest. Intended for all graduate students.

612 Advanced Topics in Quantum Field Theory (3) Renormalization group, quantum field theory in finite momentum space, quantum fields, 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.

613-14 Quantum Field Theory (3,3) Modern formulation of quantum field theory and its applications; perturbative methods, nonrenormalization, gauge theories (QED, the standard model, GUTs and their super-symmetric extensions), string theory and quantum gravity.

621-22 Nuclear Physics (3,3) 621—Survey of research problems and methods. Topics of current interest. Intended for all graduate students. 622—Advanced problems intended for students specializing in the field.

626-27 Elementary Particle Physics (3,3) Survey of elementary particle physics: experimental methods, conservation laws, invariance principles, and models of interactions. Intended for all graduate students. 627—Advanced topics intended for students specializing in field: quark models, electroweak interactions and unification of elementary forces.

629 Advanced Topics in Modern Physics (3) Advanced theoretical or experimental topics not covered in other courses. May be repeated with consent of department. Maximum 9 hrs.

643 Computational Physics (3) Developing computer algorithms for solving representative problems in various fields of physics, celestial dynamics in astrophysics, boundary value problems in electromagnetism, atomic and nuclear structures, band structure in solid state physics, transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of data, correlation analysis, or optimization strategy. Prereq: 522, 531, 542, and 572.

671-72 Advanced Solid State Physics (3,3) 671—Survey of research problems and methods. Topics of current interest. Intended for all graduate students. 672—Advanced problems intended for students specializing in field.
The Plant Sciences and Landscape Systems Department offers graduate programs leading to the Master of Science and the Doctor of Philosophy degrees with a major in Plant and Soil Sciences and a Master of Science degree with a major in Ornamental Horticulture and Landscape Design. Concentrations in the Plant and Soil Sciences programs include soil science, plant breeding and genetics, and crop physiology and ecology. Concentrations in the Ornamental Horticulture and Landscape Design program include landscape design, turfgrass, woody ornamentals, and public horticulture. Various interests may be emphasized in any of these commodity areas, including micropropagation, innovative production and maintenance systems, and molecular biology, genetics, histology and stress physiology of ornamentals.

For further information, contact the department head.

THE MASTER’S PROGRAM

Ornamental Horticulture and Landscape Design

Admission Requirements: Students having bachelor’s degrees in fields both related and unrelated to ornamental horticulture may apply. Although acceptance may require some prerequisite courses. For admission to the M.S. degree program, a student must meet all of the requirements of the Graduate Council and must have completed (in semester hours): 12 hours of upper level courses in ornamental horticulture and/or landscape design (in some cases, depending on individual student’s interests and up to the discretion of a major professor in consultation with the OHLG Graduate Coordinator, upper level courses in other agricultural, biological or environmental subjects may substitute for some or all of these hours); 6 additional hours of biological science; 6 hours of math; 8 hours of chemistry. In addition, three completed rating forms and a written statement of career goals and interest in ornamental horticulture are required.

Students from non-science fields applying for the program may wish to enroll as non-degree graduate students while taking prerequisites. Both thesis and non-thesis options are available, each guided by a graduate committee with three or more faculty members. For further information see web site at http://ohld.ag.utk.edu/psls/, or contact the graduate liaison.

Degree Requirements:

1. Approval of the academic program by the master’s committee.
2. Successful completion of 12 hours of coursework in Ornamental Horticulture and Landscape Design and Integrated Plant Systems at the graduate level (400 or above), exclusive of Ornamental Horticulture and Landscape Design and Integrated Plant Systems 500, 502, and 503.
3. Two of these hours must be 590. Six of these hours may be satisfied by Botany 412, 521, 522, Plant and Soil Sciences 532, Plant Sciences and Landscape Systems 471, Animal Science 571, Ecology and Evolutionary Biology 512, 521, 522, 560, Human Resource Development 521, 522, 562, Art 481, or Geography 439.
4. Attendance at graduate seminar each semester enrolled.
5. Preparation of a publication-ready, written or graphic communication.
6. Satisfactory preparation of a written thesis proposal and its oral defense to the student’s committee, prior to enrolling in 500.
7. Successful completion of 30 hours of graduate credit, which must include 6 hours of Plant and Soil Sciences 503. At least 14 of these hours must be at the 500 level or above.
8. Completion of a project and preparation of a written report summarizing the project.
9. Passing written and oral examinations covering the project and coursework.

Plant and Soil Sciences

Thesis Option: A written thesis based on original research is required. A graduate advisory committee will be assembled at the beginning of the student’s program. The committee consists of the major professor, who acts as chair of the committee, and at least two other faculty members. Prior to conducting research, the student must develop a detailed written research proposal that shall be approved by the student’s committee. Upon completion of the thesis, this committee will also conduct the final oral examination that integrates the thesis and coursework.

Six hours of Plant and Soil Sciences 500 Thesis are required. In addition to the thesis hours, a minimum of 24 hours of graduate coursework is required. At least 14 of these hours must be taken in courses numbered 501 and above. At least 12 of the 24 hours in Plant and Soil Sciences courses, excluding 500. The student’s committee may require additional coursework beyond the 24 hours if the student’s progress or background indicates a need or deficiency. All students pursuing a concentration in plant breeding and genetics or in crop physiology and ecology must take the following courses: Plant and Soil Sciences 512, 513, 514, and 516. All students pursuing a concentration in plant breeding and genetics or in crop physiology and ecology must take the following courses: Plant and Soil Sciences 532, 551, and 553.

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 26 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 major in one or more cognate areas. Major courses include those in: Plant and Soil Sciences, Environmental and Soil Sciences, Integrated Plant Systems, Ornamental Horticulture and Landscape Design, and Plant Sciences and Landscape Systems.

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 an cognate fields, direct the research, and recommend the dissertation for approval and acceptance by Graduate Student Services.

See the Department of Biosystems Engineering and Environmental Science for
additional details and additional major courses offered.

Integrated Plant Systems

GRADUATE COURSES

431 Physiology and Ecology in Agroecosystems (3) Plant physiology and ecology applied to crop production and management. Plant physiological and ecology principles related to crop production practices from seedling to harvesting and handling. Interaction of crops with environment and sustainable agroecosystems. Prereq: Crop science. 2 hrs and 1-2 hr lab. F

432 Agricultural Pesticides (3) Regulation of pesticide development, manufacture, transportation, marketing and use. Structure, use, mode of action, degradation and environmental impact of pesticides used in agriculture, forestry and related areas. Prereq: 1 yr biological sciences and 1 semester chemistry. 2 hrs and 1 lab. Sp

433 Fruit and Vegetable Crops (3) Principles of production systems to counter environmental stresses and to increase productivity of warm and cool season vegetable crops, small fruits, and deciduous tree fruit crops. Storage, packing, and handling. Prereq: 230 Introduction to Crop Science. 2 hrs and 1-2 hr lab. F

435 Field and Forage Crops (3) Agronomic principles of crop production and management. Crop improvement, cropping systems, tillage, fertilization, pest management, harvest and utilization of major field and forage crops. Prereq: 230 Introduction to Crop Science. 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 nutrition, climatic influences on grass culture; physiology of clipping and water management; design, construction, and management of golf courses; and physiological influences of pest infestation and control measures. Prereq: 340 Turfgrass Management or consent of instructor. 3 hrs and 1 lab. Sp

453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Consideration of breeding methods for various types of plant reproduction systems and application. Discussion of heritability estimation, genetic advances through selection and theory upon which breeding methods are based. Prereq: Plant Sciences and Landscape Systems 471 and general genetics. 2 hrs and 1-2 hr lab. Sp


494 Professional Horticultural Communications (3) Communication for public horticulturists through written, oral and visual media. Communication skills using proper writing techniques and grammar for print media, brochure design using desktop publishing, slide show development, oral presentations, and video use for educational and informational presentations in ornamental horticulture. Prereq: Agriculture and Natural Resources 290 Computer Applications to Problem Solving. 2-3 hrs lab. F

Oriental Horticulture and Landscape Design

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 Basic Landscape Plants, 330 Plant Propagation, and Environmental and Soil Sciences 210 Introduction to Soil Science, or consent of instructor. 2 hrs and 1 lab. Sp

427 Management and Administration of Public Horticulture Institutions (3) Management of resources in non-profit institutions, support organizations and communities. Theoretical framework and institutional mission; strategic planning and programing; financial accounting and budgeting; development and fund raising; personnel policies; volunteer development; marketing and publicity; legal issues; relationships between staff and governing boards; the use of information technology in management and governance systems; and conservation/preservation roles in community development. Prereq: 326 Public Horticulture. F

429 Field Study of Public Horticulture Institutions (3) Extended 10-12 day field study of various public horticulture institutions: botanical gardens, arboreta, historical characters, conservatories, cemeteries, and nature preserves. Travel journal and course portfolio required. Prereq: 326 Public Horticulture. Application and travel fee required. Sp

435 Public Garden Operations and Management (3) Analysis of year-round operations and management of public gardens. Case studies: time and labor management, budget development and management, implementation of volunteer programs, information dissemination techniques, management of grounds and facilities using the University of Tennessee Institute of Agriculture Gardens as model. Prereq: 326 Public Horticulture. Sp

446 Horticultural Therapy (3) Application of horticulture as therapy for treatment, rehabilitation and/or training of individuals with disabilities. Prereq: Senior standing and consent of instructor. A

450 Specialty Landscape Construction (3) Methods of designing, manufacturing and installing specialized components of landscape industry. Irrigation systems, outdoor lighting, garden ponds and water features. Prereq: 350 Basic Landscape Construction. Pr

451 Plant Tissue Culture (3) (Same as Botany 451.)

460 Professional Practices in Landscape Construction (3) Principles of salesmanship, proposals, bidding, estimating, specifications, and contract management in landscape services industry.6-8 hrs library, field, or laboratory work. Prereq: 460 Professional Practices in Landscape Construction. 3 hrs. F, Sp

500 Thesis (1-15) May be repeated. Maximum 6 hrs. E

500 Seminar (1) Presentations and discussion of topics. May be repeated. Maximum 2 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 Seminar (1) Presentations and discussion of current scientific material. May be repeated. Maximum 3 hrs. F

507 Professional Development Seminar (1) (Same as Agriculture and Natural Resources 507, Animal Science 507, Biosystems Engineering 507, Biosystems Engineering Technology 507, Food Science and Technology 507 and Ornamental Horticulture and Landscape Design 507.) S/NC only. F

511 Soil-Plant Relationships (3) Principles of mineral nutrition of higher plants: plant physiological characteristics that influence uptake of water and nutrients; functions of nutrient elements in plants; soil factors influencing nutrient availability to plants; important relationships at soil-plant root interface; and responses to

Plant Sciences and Landscape Systems

GRADUATE COURSES

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

501 Seminar Preparation (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to both scientific and general audiences. Preparation of abstracts for scientific presentations. Required of all entering graduate students during their first year of graduate study. 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. E

503 Seminar (1) Presentations and discussion of current scientific material. May be repeated. Maximum 3 hrs. F

507 Professional Development Seminar (1) (Same as Agriculture and Natural Resources 507, Animal Science 507, Biosystems Engineering 507, Biosystems Engineering Technology 507, Food Science and Technology 507 and Ornamental Horticulture and Landscape Design 507.) S/NC only. F

511 Soil-Plant Relationships (3) Principles of mineral nutrition of higher plants: plant physiological characteristics that influence uptake of water and nutrients; functions of nutrient elements in plants; soil factors influencing nutrient availability to plants; important relationships at soil-plant root interface; and responses to
Organismal Plant Genetics (3) Physical and chemical weathering processes, formation, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E
603 Special Topics in Crop Physiology and Ecology (1-3) Micrometeorology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and 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, mutations, chromo- some dynamics, polymody, genetic engineering, interspecific hybridization, linkage screening methods, genome organization. May be repeated. Maximum 6 hrs. E
613 Advanced Topics in Soil Chemistry and Fertility (2) Topics of current significance; scientific literature. Prereq: 513 or equivalent. Sp,A
614 Advanced Topics in Soil Biology and Biochemistry (2) Topics of current significance; scientific literature. Prereq: 516 or equivalent. F,A
615 Advanced Topics in Soil Physics, Genesis, and Morphology (2) Topics of current significance; scientific literature. Sp,A
633 Plant Metabolism (3) Metabolism of chemical compounds of economic importance in crop production: plant growth regulators, naturally occurring plant metabolites and herbicides. Prereq: Botany 522 or 522 and organic chemistry or biochemistry. Sp,A
653 Advanced Plant Breeding (4) Development and utilization of concepts of quantitative parameters, inbreeding, heterosis, methods of selection, in vitro breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prereq: 571 and Integrated Plant Systems 453 or equivalent or consent of instructor. 3 hrs and 1 lab. Sp,A
553 Plant Breeding Technologies (3) Principles and methodologies targeting genetic gain for crop improvement. Concepts of qualitative and quantitative trait improvement. Parental germplasm, population formation, hybridization, inbreeding, genetic variance, heritability, genetic gain, concepts and applications of molecular genetic markers to identify superior germplasm for increased selection efficiency. Prereq: Plant Sciences and Landscape Systems 471 or equivalent. F,A
554 Plant Pathology (3) Theory and mathematical models of disease development and resistance. Prereq: General genetics. F,A
555 Organismal Plant Genetics (3) Discovery of genetics, polyploidy, extrachromosomal inheritance, apomixis, incompatibility systems, mutations, controlling elements, quantitative inheritance and heritability. Prereq: General genetics, Plant Sciences and Landscape Systems 471 or equivalent. F,A
558 Plant Breeding (3) Principles and methodologies targeting genetic gain for crop improvement. Concepts of qualitative and quantitative trait improvement. Parental germplasm, population formation, hybridization, inbreeding, genetic variance, heritability, genetic gain, concepts and applications of molecular genetic markers to identify superior germplasm for increased selection efficiency. Prereq: Plant Sciences and Landscape Systems 471 and general genetics. F,A
571 Design and Analysis of Biological Research (3) (Same as Animal Science 571.) Sp
593 Special Problems in Plant and Soil Science (1-3) May be repeated. Maximum 6 hrs. E
600 Doctoral Research and Dissertation (3-15) P/ NP only. E
601 Special Topics in Soil Science (1-3) Thermodynamics of soil solutions, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E
602 Special Topics in Crop Physiology and Ecology (1-3) Micrometeorology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hrs. E
676 Topics in Crop Physiology and Ecology (1-3) Micrometeorology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction. Interactions of physiology and germplasm in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hrs. E
685 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromo- some dynamics, polymody, genetic engineering, interspecific hybridization, linkage screening methods, genome organization. May be repeated. Maximum 6 hrs. E
Political Science
(College of Arts and Sciences)
MAJORS DEGREES
Political Science ................................ M.A., Ph.D.
Public Administration ................ M.P.A., J.D.; M.P.A.
Patricia Freeland, Head
Professors:
Cunningham, Robert B., Ph.D. .......... Indiana University
Fitzgerald, Michael R., Ph.D. .......... Oklahoma State University
Freeland, Patricia K., Ph.D. .......... Wisconsin (Milwaukee)
Gant, Michael M., Ph.D. .......... Michigan State University
Gorman, Robert A., Ph.D. .......... New York University
Lyons, William, Ph.D. .......... Oklahoma State University
Olas, Hyram, Ph.D. .......... Utah State University
Scheb, John M., II, Ph.D. .......... Florida State University
Smith, T. Alexander, Ph.D. .......... Ohio State University

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.

Ph.D. ................. Johns Hopkins University
Ungs, Thomas D. (Emeritus), Ph.D. ......... Iowa State University
Welborn, David M. (Emeritus), Ph.D. ......... Texas A&M University

Associate Professors:
Folz, David H. (Liaison), Ph.D. ............ Tennessee Polytechnic University
Houston, David J., Ph.D. .......... SUNY (Binghamton)
Kelly, Janet, Ph.D. .......... Wayne State University
Nowes, Anthony J., Ph.D. .......... Kansas State University
Peterson, Robert L., Ph.D. .......... Yale University
Zhong, Yang (Liaison), Ph.D. .......... University of Kentucky

Assistant Professors:
Caprioli, Mary, Ph.D. ..........Connecticut College
Carcieri, Martin, Ph.D. .......... California State University (Santa Barbara)
Lipinski, Daniel, Ph.D. .......... Duke University
Van Cott, Donna, Ph.D. .......... Georgetown University

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 Office of Graduate Admissions, 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: Thesis Option: (30 hours) Coursework, preparation of a thesis, and an oral examination. It consists of a total of 39 semester hours. At least 12 of these hours must be in political science, with 6 in the field of methodology (Political Science 510 and either 511 or 512). Six hours may be earned through thesis credit. Non-Thesis Option: (36 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 either 511 or 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 1100 on the verbal and quantitative parts of the GRE is desired.

Students must demonstrate proficiency in the use of software applications for the personal computer. This requirement can be fulfilled by achieving a satisfactory grade in Political Science 596, Workshops in Computer Applications. Exceptions to this requirement will be considered on an individual basis.

The M.P.A. is a non-thesis program requiring 39 hours. Specific requirements include the following:

1. Core Curriculum (24 hours)
   a. General perspectives (9 hours) - 550 Public Administration; 552 Organization Theory; and any one of the following: 442 Administrative Law; 539 State and Local Government; 540 Public Law; 548 Public Policy Process; 558 The Politics of Administration; or 556 Ethics, Values, and Morality in Public Administration.
   b. Analytical skills (6 hours) - 512 Quantitative Political Analysis; 514 Research and Methodology in Public Administration.
   c. Management skills (9 hours) - 560 Public Budgeting and Finance; and any two of the following: 562 Public Management; 564 Human Resources Management; 556 Policy Analysis.
   d. Specialization (9 hours)
      A specialization is designed by the student in consultation with the coordinator of the M.P.A. degree program. Possible specializations include general government, public health, budgeting and finance, planning, natural resources, program evaluation, criminal justice, public relations, personnel, and others.
   e. Recommended Internship (6 hours)
      Internships are arranged in consultation with the coordinator of the M.P.A. degree program.
   f. Final Examination
      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 Arts and Sciences offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program 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 Office of Graduate Admissions for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant's LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made part-time or after matriculation to the J.D. or the M.P.A. program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

Curriculum

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

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the M.P.A. program. During those first two years, students may not take courses in the opposite area, without the approval of the J.D.-M.P.A. coordinators in both academic units. In the third and fourth years, students are strongly encouraged to take both law and political science courses each semester. Dual degree students who withdraw from the program before the completion of the requirements for both degrees will not receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

Awarding of Grades

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be computed in determining a student's GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for 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 3.5 GPA and have earned a composite score of at least 1100 on the verbal and quantitative parts of the Graduate Record Examination.

Doctoral students admitted to the program must complete 84 hours beyond the bachelor's degree, including 24 hours of coursework beyond the master's degree, graded A-F, must successfully pass written comprehensive examinations in two broad subfields of political science, and must pass a final oral examination on the dissertation. In addition, students must satisfy a research tool requirement. Usually, students meet this requirement by completing 12 hours of coursework numbered above 500 in empirical theory and research methodology. However, if a student's advisor and program committee certify that competency in a foreign language is a more appropriate research tool, a foreign language can be used instead.

In addition to the total hours required for the degree, the following requirements must also be met:

1. At least 69 hours must be in political science courses.
2. At least 54 hours in political science must be in courses numbered above 500.
3. Completion of Political Science 510, 511, and 512.
4. Completion of at least three courses or seminars at UT in each of the two broad subfields in which the students take examinations.
5. Completion of at least one course or seminar in each of the five broad subfields available for graduate instruction in the department.
6. At least 6 hours must be earned in political science courses numbered above 600.
7. 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 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. (Same as Legal Studies 430.)

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. (Same as Legal Studies 431.)
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 the structure of Congress and the behavior of legislators.

535 Mass Political Behavior (3) Theoretical and empirical analyses of political behavior, political and social attitudes, political participation, voting behavior and electoral analysis.

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 state and local 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.

548 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.

556 Policy Analysis (3) Strategies and techniques for problem 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 Financial Administration (3) Principles and techniques of public finance at state and local levels: budget preparation, execution and control; capital management, capital budgeting, capital tax structures, economic forecasting, cash management, and debt administration.

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 and 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 America, Middle East, Soviet Union and Eastern Europe or Western Europe. May be repeated with consent of department. Maximum 9 hrs.

580 International Politics (3) Survey of literature and major aspects of international politics. May be repeated with consent of department. Maximum 9 hrs.

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

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

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

594 College Teaching in Political Science (1) Instructional effectiveness, techniques, organization, materials for teaching political science at college level. Prereq: Consent of instructor. S/NC only. May be repeated. Maximum 15 hrs.

596 Workshops in Computer Applications (1) Training in software applications to support research and decision making tasks in public service. Successful completion certifies proficiency in MPA students in use of software applications for personal computer. S/NC only.

600 Doctoral Research and Dissertation (3-15) Prerequisite.

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, formal 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 making in context of constitutional law as major component of public policy. 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.

668 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

670 Special Topics in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

682 Theory and Analysis of U.S. Foreign Policy Processes (3) Theoretical approaches to decision making in foreign policy area and analysis of policy making process. May be repeated with consent of department. Maximum 9 hrs.

688 Special Topics in International Politics (3) Selected issues and problems in international politics. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.
Polymer Engineering
See Materials Science and Engineering

Psychology
(College of Arts and Sciences)

MAJOR DEGREES

Psychology ........................................ M.A., Ph.D.

James E. Lawler, Head

Professors:

Burghardt, Gordon M. (Distinguished Prof.), Ph.D. ......................... Chicago
Calhoun, William H. (Emeritus), Ph.D. California
Fine, Harold J. (Emeritus), Ph.D. ...... Syracuse
Handel, Stephen J., Ph.D. John Hopkins
Handler, Leonard, Ph.D. ...... Michigan State
Jones, Warren H., Ph.D. ...... Oklahoma State
Lawler, James E., Ph.D. ...... North Carolina
Lawler, Kathleen A., Ph.D. ...... North Carolina
Lounsbury, John W., Ph.D. ...... Michigan State
Lubar, Joel F., Ph.D. .................. Chicago
Malone, John C., Ph.D. .......... Michigan
Morgan, Wesley G., Ph.D. .............Tennessee

Assistant Professors:

Gaertner, Lowell, Ph.D. ............ North Carolina
Gordon, Kristina C., Ph.D. ...... North Carolina
Hopko, Derek R., Ph.D. .......... West Virginia

THE MASTER’S PROGRAM

Graduate study leading to the M.A. degree in psychology is available with a concentration in experimental psychology. This program is appropriate for students who desire a master’s degree as part of their progress toward a doctorate or for those who wish to complement a degree in a different field.

Admission

Any student with a B.A. or B.S. may apply to the Department of Psychology for admission to the master’s program. All students must also submit scores from the Graduate Record Examination (general and subject).

Major Advisor and Committee

Initially, the Director of Experimental Psychology will advise the student. As soon as possible, the student must select an advisor and obtain his or her approval for registration. Subsequently, the advisor and student will select two additional faculty members to comprise the student’s master’s committee. Final committee approval comes from the Graduate Dean, upon recommendation by the Department Head.

Program Requirements

All students must complete 32 semester hours of graduate level courses in psychology. These hours must include 515, 521-22, or Statistics 531-32 or an equivalent sequence; 565 or 420; six semester hours of Thesis 500; and twelve hours of 500- or 600-level foundation courses; plus additional graduate level hours to reach the 32-hour requirement. Students must earn a grade of 3 or better in all courses that are to count toward the 32-hour total. Students must also propose, conduct and successfully defend an original piece of research in the form of a master’s thesis.

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 experimental psychology or clinical psychology. All students must submit scores from the Graduate Record Examination (general and subject).

Experimental Psychology

The Ph.D. program in Psychology with a concentration in experimental psychology is designed to allow students to select from a variety of specializations oriented toward careers in research, teaching, and application of psychology in academic, institutional, or industrial settings. The program is flexible, individualized, and emphasizes a professional apprenticeship model of training.

The basic requirements are:

1. Twelve hours of statistics and research (521-22 or Statistics 531-32 or equivalent and 6 additional hours in research methods or design).
2. Fifteen semester hours in experimental psychology (565 or equivalent and 4 courses from the following: 510, 511 or 512, 513, 543, 546 or 547, 550, 560, and 570 or 571).
3. Six semester hours of research practicum (509).
4. Psychology 528 - preparation for college teaching.
5. Two 600-level graduate seminars.
6. Six semester hours of graduate level courses outside the Psychology Department.
7. Predissertation research project involving the collection of original data or the original analysis of existing data, reported in publishable form and accepted by the student’s advisory committee.
8. Comprehensive examination, determined and evaluated by the student’s doctoral committee. This examination is comprised of an integrative review or theoretical paper and an oral exam or additional questions.
9. Twenty-four hours of dissertation research (600).
10. An original piece of research in the form of a doctoral dissertation, proposed, conducted, and defended.

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 experiences oriented toward the development of practical skills. The program embodies a model of clinical psychology in which practice and research are integrated.

Clinical program students must complete a predissertation research project by the end of the second year.

After forming the doctoral committee, students must then pass a comprehensive examination administered and evaluated by the committee. This examination is comprised of two papers, one addressing a topic of the student’s choice, and the second addressing an understanding of one individual’s personality and cognitive functions. All doctoral students must complete a minimum of 78 hours of graduate level courses, including courses required by their program; at least 6 hours in courses outside of psychology; and at least 24 hours of dissertation research (Psychology 600). Finally, students must complete an acceptable doctoral dissertation and conduct a satisfactory oral defense of the dissertation.

Requirements are as follows:

1. Apprenticeship with one faculty member during the first year, two days each week.
2. Predissertation research project completed before forming a doctoral supervisory committee, reported in written form acceptable to two members of the faculty or, if reviewed and accepted for publication or external presentation, by one member of the faculty.
3. Supervised clinical placement two days (16 hours) each week during the second year, and the following option during the third and fourth years:
   a. continued two day clinical placement in the third and fourth years.
   b. teaching assistantship in the department in either the third or fourth year and two day clinical placement in the other year.
4. Satisfactory completion of listed courses (or equivalents) in the following sixteen categories:
   a. Foundations of Psychology: Biological Factors, Perception, Learning, Thinking, Motivation (513)
   b. Interviewing and Observation (558) and Laboratory (559)
   c. Research Practicum (509) (4 hrs.); Life-Span Development (512) or Developmental Psychology (511)
   d. Personality: Theory and Research I and II (570-71)
   e. History and Systems of Psychology (565)
   f. Research Questions and Designs (580)
   g. Psychological Assessment I and II (594-95) and Laboratory (596)
415 Psychology of Religion (3) History of psychology of religion: various philosophical and empirical approaches to personality: related research. Prereq: General Psychology or consent of instructor.

416 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Biological basis of emotion, learning, memory and stress. Prereq: General Psychology or consent of instructor and either Biodiversity and Organization and Function of the Cell, or Human Origins and Principles of Biological Anthropology.

470 Theories of Personality (3) Survey of major theories of human personality and their development. Prereq: General Psychology or consent of instructor.

475 Adolescent Development (3) Theoretical perspectives and empirical research findings pertinent to adolescent development. Prereq: General Psychology or consent of instructor. Sp.

480 Theories of Learning (3) Classical and current approaches to learning and cognition. Prereq: General Psychology or consent of instructor.

482 Topics in Psychology (3) Intensive analysis of special topics: Afro-American psychology or evaluation of programs in community. Prereq: General Psychology or consent of instructor. May be repeated. Maximum 6 hrs.

489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs in 399, 489, 491, 492, and 493 combined may apply toward undergraduate major.

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

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

505 Research Design (3) Techniques for planning and conducting research in controlled and natural settings: experiments, quasi-experiments, observational studies, surveys, and program-evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity. Prereq: Consent of instructor.

507 Foundations of Applied Psychology (3) Fundamental methods for application of psychology principles and techniques in community, organizational, and industrial settings, and related ethical and theoretical issues. Prereq: 505 and consent of instructor.

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 9 hrs. S/NCo only. E

510 Topics in Psychology (3) Intensive examination of selected issues in psychology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

511 Developmental Psychology (3) Normal processes of human socialization; physical, cognitive, and emotional development from conception through infancy, childhood, and adolescence. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. 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 (3) Intensive survey. Prereq: Consent of instructor.

515 Colloquium in Experimental Psychology (1) Research and practical issues in experimental psychology. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. S/NCo only. F.Sp

516 Colloquium in Ethology (1) Current research and theory. May be repeated. Maximum 9 hrs. (Same as Ecology and Evolutionary Biology 516.) S/NCo only. E

521 Analysis of Variance for Social Sciences (3) Analysis of variance: applications to social science. Prereq: 520 or equivalent. E

522 Multiple Regression for Social Sciences (3) Complexities of regression analyses and theory: application within social science framework. Bivariate correlation and regression, multiple regression, analysis of variable sets, interactions among continuous predictors, reducing co-linearity between main effects and application of multiple regression to testing procedures of mediation and moderation. Prereq: Consent of instructor.

526 General Vertebrate Neuroanatomy (3) Lecture and laboratory. Structure and functioning of central and peripheral nervous system. Prereq: 461 or equivalent and consent of instructor.

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/NCo only.


545 Advanced Animal Behavior (3) (Same as Ecology and Evolutionary Biology 545.)

546 Ethological Psychology (3) Basic ethology and comparative psychology. Implications for human behavior. Prereq: Consent of instructor. (Same as Ecology and Evolutionary Biology 546.)

547 Conceptual Foundations of Evolution and Behavior (3) Critical evaluation of seminal writings on theory and methods in comparative analysis of behavior. Prereq: Consent of instructor. (Same as Ecology and Evolutionary Biology 547.)

550 Social Psychology (3) Survey of theory and research concerning interpersonal interaction and individual behavior in social context. Prereq: Consent of instructor.

554 Laboratory in Psychometrics (3) Further learning about psychometrics theories: item response theory (modern mental test theory), factor analysis, and applications of those methods using computer programs to simulated or empirical data. Prereq. 555. May be repeated. Maximum 6 hrs.

555 Psychometrics (3) Basic concepts: factor analysis, scaling, test theories, probability models and their applications, computerized adaptive testing and other topics. Prereq. Statistics 537-538 or equivalent. May be repeated. Maximum 6 hrs.

557 Applied Psychological Measurement (3) Issues and techniques in applying psychological measurement in organizational, clinical, and community research. Prereq: Statistics 537-538 or equivalent and 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 clinical psychology or consent of instructor.

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 non-human animals. Prereq: 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 which emerged during 20th century. Prereq: Graduate standing.

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. F

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. Sp.
573 Descriptive and Theoretical Psychopathology (3) Current psychiatric taxonomic system. Theories of etiology for various diagnostic categories. Examples from written case histories and recorded interviews. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. F

575 Psychopharmacology (3) Connections between pharmacology and psychology. Prereq: Consent of instructor.

576 Object Relations (3) European and American conceptions of normal and psychopathological development of object relations. Significance for psychotherapy, psychoanalysis, and psychoanalytic theory. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

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.

593 Independent, Off-campus, or Foreign Study (1-15) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC 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. Sp

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 and 594 or consent of instructor. F

596 Laboratory in Psychological Assessment (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 4 hrs. S/NC only. Sp

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

601 Seminar in Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


610 Seminar in Applied Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

613 Seminar in Existential-Phenomenological Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


623 Seminar in Methods of Naturalistic Research (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

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 Counselor Education and Counseling Psychology 635 and Psychoeducational Studies 635.) S/NC only.

670 Psychotherapy I (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. F

671 Psychotherapy II (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology and 670 or consent of instructor. Sp

673 Laboratory in Psychotherapy (2) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 670 or 671. May be repeated. Maximum 6 hrs. S/NC only.

683 Seminar in Behavioral Medicine (3) Current research on determining relationships between behavior and health. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

695 Field Placement in Clinical Psychology (3) Prereq: Admission to doctoral program in clinical psychology and consent of instructor. May be repeated. Maximum 24 hrs. S/NC only. E

696 Advanced Psychology Clinic Placement (1-3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 24 hrs. S/NC only. E


Religious Studies
(College of Arts and Sciences)

James L. Fitzgerald, Interim Head

Professors:
Dungan, David L., Th.D. ................. Harvard
Fitzgerald, James L., Ph.D. ............... Chicago
Hackett, Rosalind I. J., Ph.D. .......... Aberdeen
Humphreys, W. Lee (Emeritus), Pr.D. ..., Union
Linge, David E. (Emeritus), Ph.D. .... Vanderbilt
Lusby, F. Stanley (Emeritus).
M.Div. ................................ Colgate Rochester
Levering, Miriam L., Ph.D. .............. Harvard
Norman, Ralph V., Jr., Ph.D. .......... Yale
Reynolds, Charles H., Ph.D. .......... Harvard
Schmidt, Gilya G., Ph.D. ............... Pittsburgh

Associate Professors:
Gwynne, Rosalind W., Ph.D. .......... Washington
Hodges, John O., Ph.D. ............... Chicago
Huelseher, Mark, Ph.D. ............... Minnesota

A master’s degree in Philosophy with a concentration in religious studies is available. Contact the department for details of this program. 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

405 Modern Jewish Thought (3) History, culture, and geography of the now Israeli portion of Levant from 1850 to present. Founding of modern state of Israel in 1948 and political complexities of Middle East. Israeli culture and literature. Writing emphasis course. (Same as Judaic Studies 405.)

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 philosophic problems of traditions of Samkhya, Yoga, Vedanta, Buddhism, or Jainism. Prereq: 374 or 376 or consent of instructor.

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.

440 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

490 Readings and Research in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
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 higher, and (3) personal qualifications acceptable for entrance into the professional practice of social work. Applicants falling below this average may be considered for probationary admission based on evidence of the ability to perform at a satisfactory level. The University requires a minimum GPA of 2.7 for admission to graduate study.

3. Personal qualifications acceptable for entrance into the professional practice of social work.

4. All applicants must submit up-to-date scores from the Graduate Record Examination (general). Preference is given to applicants with a GPA of 3.0 or above in their undergraduate work and those who have completed at least 45 semester hours of coursework leading to a B.S.W. degree.

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 higher, and (3) personal qualifications acceptable for entrance into the professional practice of social work. Students admitted into the program are required to complete a minimum of 36 hours of study in either the college's concentrations - clinical social work practice or social work management and community practice. These students will follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program.

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 locations of the college. Admission requirements are the same as for full-time study. Coursework can be completed over a three-year period.

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. Information regarding scholarships administered by the College is made available after admission.

THE MASTER’S PROGRAM

The Master of Science in Social Work program prepares social workers to provide professional leadership in 1) clinical social work practice and 2) social work management and community practice. These objectives are met through a curriculum requiring of all students a professional foundation and a concentration in either clinical social work practice or social welfare management and community practice. The M.S.S.W. program is accredited by the Council on Social Work Education.

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 Arts and Sciences subjects. Applicants must have a course in biology and demonstrate a liberal arts perspective through coursework in at least four of the following five areas: economics or mathematics; government, political science or history; sociology or anthropology; psychology; philosophy, literature, or the arts.

2. A grade point of 2.7 or higher on a 4.0 scale. Applicants falling below this average may be considered for probationary admission based on evidence of the ability to perform at a satisfactory level. The University requires a minimum GPA of 2.7 for admission to graduate study.

3. Personal qualifications acceptable for entrance into the professional practice of social work.

4. All applicants must submit up-to-date scores from the Graduate Record Examination (general). Preference is given to applicants with a GPA of 3.0 or above in their undergraduate work and those who have completed at least 45 semester hours of coursework leading to a B.S.W. degree.

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 higher, and (3) personal qualifications acceptable for entrance into the professional practice of social work. Students admitted into the program are required to complete a minimum of 36 hours of study in either the college’s concentrations - clinical social work practice or social work management and community practice. These students will follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program.

Application for admission to the advanced standing program is through the regular admission process.

Clinical Social Work Practice

The clinical social work practice concentration focuses on students developing expertise in clinical social work practice with client systems including individuals and small groups, particularly with clients from high-risk and vulnerable groups. The concentration emphasizes theoretical and empirical knowledge and practice skills in differential assessment, clinical interventions and practice evaluation. The concentration also emphasizes knowledge and skills directed toward (1) amelioration of complex psycho-social, interpersonal problems; (2) ethically sound and culturally sensitive practice; and (3) influencing the development of services and programs that are responsive to the needs of vulnerable, high-risk clients and groups.

Required courses:

- 521 Clinical Social Work Practice with Individuals (3 hours)
- 525 Clinical Social Work Practice with Groups (3 hours)
- 526 Evaluating Clinical Practice (3 hours)
- 582-83 Field Practice (12 hours)

General Requirements

1. The program requires successful completion of a minimum total of 60 semester hours including completion of the foundation curriculum (30 hours) and 30 hours in one of the two concentrations (clinical social work practice or social welfare management and community practice).

2. Students may select a thesis or non-thesis option. Students pursuing the thesis option receive six credit hours for successful completion.

3. Students must successfully complete a comprehensive exam or thesis defense.

4. Students must have an overall GPA of 3.0 or better on all graded courses and satisfactory performance in field:

The Professional Foundation Curriculum

All students must complete 30 semester hours in the foundation curriculum consisting of 24 hours in foundation classroom courses and 6 hours in field practice. The foundation is the initial phase of the master’s program. It contributes to the process of professional identification and presents a comprehensive, broad base of theory, knowledge and skills from which to practice. The foundation classroom courses include Foundations of Social Work Practice I, II and III; Human Behavior in the Social Environment I and II; Social Welfare Policy and Services; Social Work Research; and Social Work and Oppression. Students also complete a two-semester field placement, Field Practice (6 hours). Upon successful completion of the foundation curriculum, all students must complete a minimum of 30 hours in the concentration curriculum including field practice (12 hours). Students select a concentration in clinical social work practice or social welfare management and community practice.

Clinical Social Work Practice: The clinical social work practice concentration focuses on students developing expertise in clinical social work practice with client systems including individuals and small groups, particularly with clients from high-risk and vulnerable groups. The concentration emphasizes theoretical and empirical knowledge and practice skills in differential assessment, clinical interventions and practice evaluation. The concentration also emphasizes knowledge and skills directed toward (1) amelioration of complex psycho-social, interpersonal problems; (2) ethically sound and culturally sensitive practice; and (3) influencing the development of services and programs that are responsive to the needs of vulnerable, high-risk clients and groups.

Social Welfare Management and Community Practice: The social welfare
management and community practice concentration focuses on students' developing skills directed toward the management and analysis of complex social service delivery needs within organizations and communities, knowledge and skills in the development of service intervention strategies to address such needs, and the organizational and management skills that enable practitioners to work in a variety of challenging and turbulent environments. The concentration emphasizes theory and skills related to leadership and administration and permits flexibility in tailoring a program to fit the student's individual interests, capabilities, and career goals.

Required courses:
541 Leadership and Management in Human Services (3 hours)
543 Financial Management and Resource Development (3 hours)
547 Evaluation Research (3 hours)
582-83 Field Practice (12 hours)
Minimum of three (total of 9 hours) advanced course electives as follows: One course in research methods (3 hours). Two courses from a pool of advanced general courses (6 hours).

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 that meet 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 during the second year.

First-year agency placements are selected to provide practice experiences related to the foundation curriculum content. Within the placement, each student's experiences are planned and designed according to students' 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.

Students receiving a grade of NC in field practice may not repeat the field practice.

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 Council 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 Council 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 Catalog 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. Students have the opportunity to work in the Children's Mental Health Services Research Center as part of their training. The Center focuses on services to children who have experienced mental health problems associated with abuse, neglect, violence and a variety of psychosocial problems.

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 66 hours beyond the master's degree including: a) completion of 27 hours of required coursework, b) completion of 15 credits of advanced electives, at least 12 of which are taken outside the department, and 9 of those 12 related to the dissertation, and c) completion of at least 24 credit hours 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 27 hours of coursework in the history and philosophy of social work, issues in direct service and administration and planning, areas of practice, and research methodology and statistics. Upon this foundation, students and their academic committees develop a plan of study consisting of coursework in Social Work and other departments of the University.

Typically, the 24 hours of foundation curriculum are completed and elective coursework begun during the first year of study. Social Work 670 and the elective requirement are completed and dissertation research begun in the second year of study, and dissertation research is continued in the third year of study. While it is generally expected that the coursework will be completed on a full-time basis, dissertation research can be completed on a planned part-time basis.

Specific courses required are 601, 602, 612, 613, 640, 650, 670, 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 comprehensive exam 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, at the Knoxville location, 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.

POST-MASTER’S CERTIFICATE IN MANAGEMENT AND COMMUNITY PRACTICE

The College of Social Work offers a 15-credit hour post-master’s certificate program designed for social workers desiring supervisory, management, administration and community practice training and education to enhance career advancement or career redirection. A master’s degree in social work or a closely related field is required for admission.

Course requirements are 541, 543, 547, and two courses selected from 550, 551, 552, 555.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S.S.W. and Ph.D. programs in Social Work are available to residents of the state of Arkansas; the Ph.D. to residents of Delaware, Oklahoma or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

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

501 Foundations of Social Work Practice I (3) Survey of history, mission, and identity of profession. Basic theory, professional values and ethics, and methods general to social work practice at various levels. Assessment, planning, communica- tion, intervention, and evaluation skills.

502 Registration for Use of Facilities (1-15) Re- quired 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 Foundations of Social Work Practice II (3) General practice with family and small group sys- tems. Ecological theory to frame understanding of such systems and their adaptation to environments. Various social work roles and intervention strategies pertaining to client systems.

504 Foundations of Social Work Practice III (3) Basic theory, methods, problems, and strategies in implementing planned change within and among larger social systems: task groups, human service organiza- tions, and community systems. Various practice roles: planner, program developer, supervisor, administra- tor, advocate and task group leader.

506 Social Work Research (3) Research methodolo-gies with respect to evolution and application to social work theory and practice. History and philosophies of science; problem formulation; research design; ethics; instrument use; social construction; data collection; analysis and reporting; and evaluation and utilization of research.

508 Practicum in Social Work Research (3-6) Supervised practice in application of research methods to social work. May be repeated. Maximum 6 hrs. S/NC only.

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

514-15 Human Behavior in the Social Environment I, II (3,3) Major social science theories that inform social work practice and understanding of human behavior and social systems from ecological perspec- tive. Interactions among biological, social, psychologi- cal, and cultural systems on development across life cycle. Effects of ethnic, racial, economic, gender, and sexual orientation variables. 514 — Life cycle from infancy through adolescence. 515 — From young adult- hood through senescence.

516 Social Welfare Policy and Services (3) De- velopment of contemporary social policy at local, state, national, and international levels. Contribution of social work to formal policy making process through which macro social change is effected and through which aggregate social welfare services are proposed, authorized, financed, and programmed. Theories of complex organizations applied to social welfare service delivery settings.

518 Social Work and Oppression (3) Sources, dynamics, and impact of oppression in U.S. society as manifested in both social/ecological/economic systems and personal experience. Connections among various forms of oppression: racism, sexism, classism, and heterosexism, and forces that perpetuate such conditions.

521 Clinical Social Work Practice with Individuals (3) Theory, knowledge, and skills for clinical practice with individuals from ecological perspective. Thera- peutic process and intervention strategies, incorporat- ing content from psychodynamic and cognitive prac- tice models, and specific client problems.

523 Clinical Social Work Practice with Families (3) Concepts related to understanding and analyzing fam- ily dynamics and interactional patterns from perspec- tive of major family therapy models. Techniques of intervention in terms of application to families with varied system and individual problems and to families from varied social and cultural backgrounds.

525 Clinical Social Work Practice with Groups (3) Theoretical and historical approaches to social work with groups and clinical principles supporting specific types of group work used in clinical practice and associated leader interventions.

526 Evaluating Clinical Practice (3) History and philosophies, conceptual approaches, techniques and methods in the practice and use of practice research as applied to implementation and evaluation of direct service. 527 — Life cycle from infancy through adolescence.

530 Seminar in Clinical Social Work (2-3) Topics in theory and practice of clinical social work with individu- als, couples, families and groups. May be repeated. Maximum 6 hrs.

532 Short-Term Interventions (3) Theory and prac- tice of planned short term, emergency, and crisis interventions.

533 Social Work Interventions with Couples (3) Theories regarding contemporary marital/partnering lifestyles, problem areas in relationships, methods and skills for problem resolution.

534 Social Work Interventions with Children and Adolescents (3) Psychological and sociological practice modalities for ass- essing and intervening with children and adolescents.

535 School Social Work (3) Place of school as community institution and resource. Methods, pro- cesses, and techniques employed in school social work.

540 General Topics in Social Work (3) Current topics in advanced social work. May be repeated. Maximum 6 hrs.

541 Leadership and Management in Human Ser- vices (3) Management practices and leadership skills required in development and management of human services delivery systems. Issues regarding human resources management, resource allocation, strategic planning, and organizational dynamics.

543 Financial Management and Resource Develop- ment (3) Administrative decision-making related to financial planning and resource allocation in human service organizations. Knowledge and skills in budget- ing, allocating, expenditure control, fundraising, grant writing, marketing, and evaluation.

547 Evaluation Research (3) History and philoso-phies, conceptual approaches, techniques and meth- ods of issues in practice and utilization of evaluation research as applied to development and evaluation of social work programs and policies. Issues pertaining to social work practitioners’ impact on individuals and groups and for evaluating processes and outcomes of social work practice.


552 Community Organization (3) Locality develop- ment, social planning and social action as practice models for development of resources to meet human needs.

554 Substance Abuse (3) Survey and analysis of social, cultural, medical and psychological factors underlying alcoholism and drug abuse and addiction, recent research and practice innovations.

556 Social Gerontology (3) Physical, psychological and social aspects of aging, and major social policies and programs.

580 Field Practice (3) Instruction and supervision in social work practice. S/NC only.

581 Field Practice (3) Instruction and supervision in social work practice. S/NC only.

582 Field Practice (6) Instruction and supervision in clinical social work practice or management and commu- nity practice. S/NC only.

583 Field Practice (6) Instruction and supervision in clinical social work practice or management and commu- nity practice. S/NC only.

584 Field Practice (2-6) Instruction and supervision in social work practice. May be repeated. S/NC only. E

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Counseling Education and Counseling Psychology 585, Exercise Science 585, Nursing 585, Public Health 585, Psychosocial Emotions Studies 585, and Sociology 585.)

593 Independent Study (1-6) Individualized study, student selects, designs, and completes examination of special issue or problem. May be repeated. Maximum 6 hrs.

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

601 Research for Social Work Practice I (3) Episte- mological and methodological considerations for both quantitative and qualitative research for social work practice. F

602 Research for Social Work Practice II (3) Episte- mological and methodological considerations for both quantitative and qualitative research for social work practice. Sp

604 Research in Social Service Settings (3) Ad- vanced research, under faculty supervision, of prac- tice issues in community agency. Prereq: First year required Ph.D courses or consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

605-06 Analysis of Social Work Data I, II (3,3) Techniques for quantitative analysis of social work data; unique data analysis problems encountered in social work research.

608 Evaluative Research for Social Work Practice, Programs and Policy (3) Techniques and strategies for quantitative and qualitative analysis for social work practice; impact on individuals and groups and for evaluating processes and outcomes of social work practice. F.
612 Social Work Practice and Its Social Context I
(3) Critical analysis of knowledge bases of major practice modalities in direct intervention. F

613 Social Work Practice and Its Social Context II
(3) Critical analysis of knowledge bases of major practice in administration and planning. Sp

640 History of American Social Work
(3) Social, cultural, political and economic contexts for development and evolution of social work profession, development of education for profession, and modern welfare system. F

650 Programs and Legislation for Children
and Families (3) Background, purposes, and current issues surrounding major social welfare and health programs serving disadvantaged children and their families: Social Security Act (Title IV, Child Welfare and AFDC; Title V, the Maternal and Child Health Block Grant; Title XIX, Medicaid), Head Start, WIC and other nutrition programs, and Healthy Start. Current issues and controversy; legislative changes. 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

670 Critical Literature Reviews
(3) Techniques and methods for conducting critical reviews of literature: conceptual and methodological critiques of existing research. S/NC, only.

693 Directed Study in Social Work Research
(3) Advanced individual study, under faculty guidance, of social work practice issues. Prereq: First year required Ph.D. courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

Sociology
(College of Arts and Sciences)

MAJOR DEGREES
Sociology ................................. M.A., Ph.D.

Suzanne B. Kurther, Head

Professors:

Hastings, Donald W., Ph.D. .... Massachusetts
Hood, Thomas C., Ph.D. .............. Duke
Perrin, Robert G., Ph.D. ............. British Columbia
Shover, Neal, Ph.D. .......................... Illinois
Wallace, Samuel E., Ph.D. ........ Minnesota

Associate Professors:

Bui, Hoan, Ph.D. .................... Michigan State
Shefner, Jon, Ph.D. ................. California (Davis)

The Sociology Department offers graduate study leading to the Master of Arts and the Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option. The graduate program has concentrations in criminology; energy, environment, and resource policy; and political economy. The criminology concentration includes 505, 551, 563, and 655. The energy, environment and resource policy concentration includes 560, 563, 661, and 665. The political economy concentration includes 504, 540, 541, 543, 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 Programs and Curriculum Committee in Sociology. New students are admitted in fall semester only and applications must be received by the Graduate Student Services Office by February 1.

ADMISSION REQUIREMENTS
1. Acceptable scores on the general Graduate Record Examination (verbal, quantitative, and analytical) are required.
2. Three letters of recommendation (forms may be obtained from the department).
3. Completion of the appropriate previous degree (baccalaureate, preferably with a major in one of the social sciences, for the M.A. program; master's degree in one of the social sciences for the doctoral program).

THE MASTER’S PROGRAM

Thesis Option
A minimum of 30 hours beyond the baccalaureate degree, including 24 hours of coursework and 6 hours of Thesis 500, is required. Students must complete Sociology 521, 531, Statistics 531, and one foundation course (504, 505, or 560). At or near the end of all coursework, the student must take an oral examination on course material and thesis. The examination will be administered by the student’s committee.

Non-Thesis Option
A minimum of 30 hours of coursework is required, including Sociology 521, 531, Statistics 531, and one of the following: 504, 505, or 560. Sociology 534, 622, and Statistics 532 are recommended. A student’s plan of study should follow one of the following approaches: Plan 1, 6 hours in one of the department’s concentrations and 6 hours in a second area, including areas outside the department, subject to the approval of the student’s committee; Plan 2, 12 hours in a special area of study approved by the student’s committee and the department’s Programs and Curriculum 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 their general coursework in theory and methods and their special areas of study. Subject to approval by the student’s committee, up to 12 hours may be taken in courses outside the department for either program. Sociology courses at the 400 level may also be taken with the approval of the student’s committee.

THE DOCTORAL PROGRAM

Coursework
Twenty-four hours of coursework beyond the master’s degree are required (exclusive of S/NC credits). 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, Statistics 531) or their equivalents must take them as remedial work which does not apply to their residence. Students must complete Sociology 622; 534, 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 his/her educational goals within the department’s concentrations may construct an individualized course of study subject to the approval of the student’s doctoral committee and the Programs and Curriculum Committee. Sociology courses at the 400 level may not be taken without the consent of the student’s advisor and the Programs and Curriculum Committee. Six hours may be taken in related fields without petitioning the Programs and Curriculum 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 Graduate Student Services.

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

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 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 on an in-state tuition basis. The M.A. program in Sociology is available to residents of the state of Virginia (concentration in criminology only); the Ph.D. to residents of Florida (concentration in criminology only), or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.
GRADUATE COURSES

405 Sociology of Sport (3) Social meaning, organization, and process of sport. Prereq: 291 or consent of instructor.

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 the aging process has on society, effect of society on older people.

446 The Modern World System (3) Critical examination of capitalist world-system as social system, its coherence, boundaries, regions, member groups, cleavages, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.


455 Society and Law (3) How laws and legal processes are affected by social change, social impact of legal sanctions, relations between law and social justice. (Same as Legal Studies 455.)

459 White-Collar Crime (3) Distinctive nature and dynamics of white-collar crime, victims and costs of white-collar crime, organizational structures as white-collar offenders, causal theories, and dynamics of responses to white-collar crime by private and public parties.

462 Population (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.)

465 Social Values and the Environment (3) Human dimensions of ecosystem management and public policy. Applied focus on social values activated within specific biophysical and social settings. Prereq: 110 Social Problems and Social Change or 120 General Sociology or consent of instructor.

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

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

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

504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict.

505 Foundations of Criminology (3) Critical overview of contemporary 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 society.

531 Research Methods in Sociology (3) Research design, measurement, sampling, quantitative and qualitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Underlying assumptions, critical issues, and approaches to sociological research and social problems, research design, and techniques of sociologists in formulating explanations; foundations of sociological research strategies and techniques.

540 Occupations (3) Occupations in relation to individuals and society, technology, economic stratification, and social organizations.

541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social unrest in human collectivities and efforts of collectives to change existing society.

543 Sociology of Development (3) Societal theories and studies 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 characteristics 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 Arts and Sciences.

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

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

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) Distinct schools of sociological theory and contributions of their principal exponents. Prereq: 521 or consent of instructor.

629 Supplementary Readings in Sociological Theory (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of instructor. S/N only.

633 Survey Design and Analysis (3) Systematic experimentation and testing of hypotheses through participation in design and analysis of survey. Prereq: 531 or consent of instructor. (Same as Child and Family Studies 633.)

636 Field Research (3) Research experience in selected field sites using techniques of interviewing, participant observation, and other methods of field research. Prereq: 531 or consent of instructor.

639 Supplementary Readings in Methodology (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of department. S/N only.

644 Political Sociology (3) Critical examination of theories of state and political processes.

645 Advanced Studies in Political Economy (3) Topical seminar. Prereq: 504 or consent of instructor. May be repeated. Maximum 6 hrs.

649 Supplementary Readings (3) Prereq: Consent of department. May be repeated. Maximum 6 hrs. S/N only.

653 Sociology of Law (3) Intensive examination of selected topics in sociology of law. Prereq: 505 or consent of instructor.

655 Advanced Studies in Criminology (3) Intensive examination of selected topics in criminology. Recommended prereq: 505. May be repeated. Maximum 6 hrs.

661 Theory and Methods of Human Ecology (3) Historical and contemporary studies of interaction between humans and their environment. Prereq: Consent of instructor.

665 Advanced Studies in Energy, Environment and Natural Resources Policy (3) Topical seminar covering particular lines of research and theory within area. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

675 Advanced Studies in Social Psychology (3) Selected contemporary research issues related to social psychological theories. Prereq: 541 or consent of instructor. May be repeated. Maximum 6 hrs.

695 Advanced Special Topics (3) Topic of special interest or student-initiated courses that will not be regularly offered. Prereq: Consent of department. May be repeated. Maximum 6 hrs.


Spanish

See Modern Foreign Languages and Literatures

Speech Communication

(College of Communications)

MAJORS

DEGREES

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

John W. Haas, Head

Professors:

Julian, Faye D. (Liaison), Ph.D., M.D. .... Tennessee

Lester, Lorayne W., Ed.D. .................. Tennessee

Yeomans, G. Allan (Emeritus), Ph.D. ........................................ Louisiana State

Associate Professors:

Ambrester, M. L., Ph.D. ..................... Ohio

Cook, N. C., M.A. ............................ Alabama

Glenn, Robert W., Ph.D. .................. Northwestern

Haas, John W., Ph.D. ..................... Kentucky

Assistant Professors:

Amler, R. S., Ph.D. ........................ Ohio State

Halone, Kelby K., Ph.D. ................... Oklahoma

Violanti, Michelle T., Ph.D. .............. Kansas

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

Graduate courses in Speech Communication also provide opportunities for students in a variety of disciplines to investigate how human oral language can effect changes in the knowledge, the understanding, the ideas, the attitudes, or the behavior of other human beings.

GRADUATE COURSES

466 Rhetoric of the Woman's Rights Movement to 1930 (3) Historical and critical study of public address in campaign for women's rights in United States from 1830's through 1920's. (Same as Women's Studies 466.)
476 Rhetoric of the Contemporary Feminist Movement (3) Historical and critical study of rhetoric in campaign for women’s rights in United States from 1940’s to present. (Same as Women’s Studies 476.)

505 Research Methods (3) Understanding of wide array of data collection and analysis procedures used in speech communication research. Development of project/thesis proposal.

510 Orientation to Teaching Assistantship (1) Curriculum, classroom management, and other issues associated with teaching at college level. For departmental GTAs.

525 Seminar in Interpersonal Health Communication (3) Current research in health communication: support groups, medical ethics, medical narratives, doctor-patient communication, or interpersonal communication theoretical perspectives in medicine.

550 Organizational Culture (3) Clarification of complex nature of organizational culture to communicate meaning and its usefulness to organizational effectiveness: challenges created by today’s changing organizations and workforces.

560 Special Topics in Speech Communication (3) Contemporary topics. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

580 Contemporary Rhetorical Theory (3) Current theoretical contributions to rhetoric: Burke, Perelman, Weaver, feminist and critical scholars.

590 Directed Reading and Research (3) May be repeated. Maximum 6 hrs.

591 Foreign Study (1-15) Independent study outside U.S. Prior to departure student must have plan of study approved by department head and supervising faculty member. Credit given only upon fulfilling all requirements set by department. May be repeated. Maximum 15 hrs.

592 Off-Campus Study/Internship (1-6) Independent study outside traditional classroom setting: community involvement and/or work experiences. Credit given only upon fulfilling all requirements set by department. May be repeated. Maximum 6 hrs.

593 Independent Study (1-6) Independent study by individual under direction of faculty member. Must obtain approval of faculty member and department prior to study.

Statistics

(College of Business Administration and Intercollegiate Program)

MAJORS

Statistics ............................................ M.S.
Business Administration ..................... Ph.D.

Robert W. Mee, Head

Professors:
Bozdogan, Hamparsum, Ph.D. ............... Illinois
Guess, Frank M., Ph.D. ....................... Florida State
McLean, Robert A. (Emeritus), Ph.D. ............ Purdue
Mee, Robert W., Ph.D. ....................... Iowa State
Parr, William C., Ph.D. ........... Southern Methodist
Philpot, John W. (Emeritus), Ph.D. ............... VPI
Sanders, Richard D. (Emeritus), Ph.D. .... Texas
Sylvester, David L. (Emeritus), Ph.D. .......... Stanford
Thigpen, Charles C. (Emeritus), Ph.D. ....... VPI

Associate Professors:
Leitnaker, Mary G., Ph.D. ..................... Kentucky
León, Ramón V., Ph.D. ....................... Florida State
Seaver, William L., Ph.D. ............ Texas A&M
Walker, Esteban, Ph.D. ..................... VPI
Younger, M. S. (Liaison), Ph.D. ............... VPI

Assistant Professors:
Bensmail, Halima, Ph.D. ....................... Paris
Kim, Hyunjoong, Ph.D. ....................... Wisconsin

Additional Intercollegiate Program Faculty:
Aikens, Charles, Engineering; Bates, Ben, Communications; Bunting, Dewey, Arts and Sciences; Carney, Paula, Human Ecology; Chang, Hui, Business Administration; Chatterjee, Arun, Engineering; Eastwood, David, Agricultural Sciences and Natural Resources; Gant, Michael, Arts and Sciences; Glisson, Charles, Social Work; Gross, Louis, Arts and Sciences; Huck, Schuyler, Education; James, Law, Business Administration; Ladd, R. T., Business Administration; Lounsbury, John, Arts and Sciences; Lyons, William, Arts and Sciences; McLemore, Dan, Agricultural Sciences and Natural Resources; Melford, Linda, Nursing; Miller, Mark, Communications; Orme, John, Social Work; Rajput, Balam, Arts and Sciences; Rosinski, Jan, Arts and Sciences; Samejima, Fumiko, Arts and Sciences; Saxton, Arnold, Agricultural Sciences and Natural Resources; Schmidhammer, James, Business Administration; Singletary, Michael, Communications; Smith, Julius, Arts and Sciences; Wagner, Carl, Arts and Sciences; Xiong, Jie, Arts and Sciences.

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 Practical Strategies for Process Improvement Institute and related programs, department faculty participate in a variety of consulting and research projects in industry. Students may supplement their classroom study with an industrial internship and participation in research projects dealing with industrial problems. Department faculty also collaborate with researchers from many academic disciplines. 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 or mleitnaker@utk.edu or http://www.bus.utk.edu/stat.

Admission Requirements

General admission requirements for graduate study 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 and 1 hour in statistical computing. 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 (IGSP) is a formal University of Tennessee academic program established to enable students to earn either a minor or an M.S. in Statistics simultaneously with a master’s or doctoral degree in another department. Approved coursework taken to meet doctoral requirements in the student’s home department may also be credited toward the M.S. in Statistics. Similarly, approved coursework in statistics taken to meet the requirements for a master’s or doctoral degree in another department may also count toward the minor in Statistics. The program is open to graduate students in all departments which have an approved minor and/or M.S. joint major curriculum offered through the program. The program is administered by an Executive Committee, consisting of college representatives from all colleges with approved programs, with advisory input from the program faculty.

Degree Program Hours in Approved IGSP Courses

Master’s in home department, minor in Statistics ......................................................... 9
Master’s in home department, M.S. in Statistics ......................................................... 24
Doctorate in home department, minor in Statistics ..................................................... 15
Doctorate in home department, M.S. in Statistics requires 33 hours.

Course options consist of courses in statistics, offered either by the Department of Statistics or by other departments, which have been reviewed and approved by the IGSP Executive Committee. Students taking an M.S. in Statistics must pass the two-part comprehensive examination covering statistical theory and methods. Students taking a minor in Statistics in conjunction with a doctorate in another field must pass a written comprehensive examination in Statistics, constructed and evaluated by the student’s Examination Committee. No formal comprehensive examination is required of students earning a Statistics minor along with a master’s in another field beyond questions which the home department wishes to include as part of the comprehensive examination for the master’s degree.

General Admissions and Degree Requirements
1. The student’s home department must have approved a program of courses with the IGSP Executive Committee. The program will specify the sequences of statistics courses, chosen from the IGSP approved list, that are considered appropriate by the home department. Students who wish to participate in this program should contact their college representative or the Chair of IGSP in the Department of Statistics.
2. The student’s graduate committee must include a member of the IGSP faculty. For students seeking doctoral degrees or the M.S. in Statistics, the committee member must be a faculty member in the Statistics Department.
3. The student’s Admission to Candidacy form must contain all courses required for the chosen degree program set off in a group and labeled “Statistics Courses Required for the Minor or M.S. in Statistics.” Should the student not decide to apply for admission to the program until after completion of some of the courses, the student’s major professor should file a program change with the cooperating departments and assist the student in obtaining a Department of Statistics faculty member to serve on the student’s graduate committee.

Successful completion of the Statistics M.S. or minor is recognized by appropriate documentation on the student’s transcript. Students who do not complete the requirements of the minor or M.S. will still receive academic credit for the statistics courses they have successfully completed.

For information contact msyoung@utk.edu or http://www.bus.utk.edu/stat/igsp.

BUSINESS ADMINISTRATION CONCENTRATION
For complete listing of program requirements see Business Administration.
Ph.D. Concentration: Statistics
This degree provides students with a broad knowledge of the field of statistics, the ability to apply statistics in practical situations to problems of business and industry and the ability to develop new statistical methods; all of which takes place while students are exposed to coursework in the basic functional areas of business.

Minimum course requirements are: 592, 662, 663, 664, 691, and two courses chosen from 666, 673, 674, 679.

CERTIFICATE IN APPLIED STATISTICAL STRATEGIES
The Department of Statistics offers a certificate program in applied statistical strategies. The program is designed for the part-time student, and several of the courses are offered through distance education. The 12-credit certificate is available by completing two required courses, 571-72, and two electives selected from the following: 573, 575, 579, and 585 or 566 or other graduate statistics courses as approved by the Statistics Graduate Program Committee chair.

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 IGSP program unless the student’s cumulative graduate grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester’s coursework as established by the degree program for full-time students and the next two semesters’ coursework as established by the degree program for part-time students.

GRADUATE COURSES

500 Thesis (1-15)
502 Registration for Use of Facilities (1-15)

571 Statistical Methods (3) Basic probability models and theory of distributions and probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation. Credit not given for both 531 and 537. Prereq: 1 yr. undergraduate mathematics and 1 undergraduate statistics course.
531 Applied Regression Analysis (3) Linear regression. Theory, applications, and use of statistical software. Prereq: 571 or 572 or consent of instructor.
531 Multivariate methods: estimation, tests of hypotheses, analysis of variance, nonparametric methods. Prereq: 571 or 572 or consent of instructor.
563 Introduction to Mathematical Statistics (3) Basic probability models and theory of distributions and probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation. Credit not given for both 531 and 537.
564 Theory of Statistical Inference (3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 563.
565 Statistical Techniques in Industrial Processes (3) Applications of control charts and other statistical techniques in industrial applications. Design of experiments and control charts, process capability analysis, aspects of sampling, statistical tolerancing, estimation of variance components, problems of measurement, special industrial applications. Prereq: 571 or equivalent.
573 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations; factorial experiments, completely randomized designs, analysis of covariance, split-plot and nested designs, fractional factorials, sequential designs. Prereq: 571. Sp
575 Applied Time Series (3) Fundamental concepts of time series analysis: Box-Jenkins approach, stationary and nonstationary models, forecasting model identification, seasonal affects, transfer function models, and spectral theory. Prereq: 538 or 572 or consent of instructor.
578 Categorical Data Analysis (3) Log-linear analysis of multidimensional contingency tables. Logistic regression, logit theory, applications and use of statistical software. Prereq: 1 yr. graduate level statistics, regression analysis and analysis of variance, or consent of instructor.
583 Special Topics in Applied Statistics (1-3) May be repeated. Maximum 9 hrs.
585 Principles of Statistical Process Management (1-3) Statistical and other techniques applied to management of organizational processes. Prereq: Consent of department head.

587 Graduate Seminar (1) Directed readings and active participant program of 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 business, industry, or government. Written and oral report. Prereq: 4 courses in graduate-level statistics or 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 Practicum (1-6) Supervised experience helping on-campus researchers plan, manage data, and develop and perform analyses specific to designs and hypotheses. Discussion of activities in regular seminar meetings. Final written reports and/or detailed diaries. Prereq: 572 or 538. May be repeated. Maximum 6 hrs.

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

652 Computational Methods in Statistics (3) Up-to-date computational methods in statistics: open and interactive computational languages supplemented by other statistical packages with graphical capabilities. Statistical computing, numerical methods for linear models and generalized linear models, non-linear statistical methods, matrix computations and special matrices, essentials of Monte Carlo simulation and resampling techniques. Prereq: Knowledge of programming language and 572 or consent of instructor.


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.

674 Advanced Data Mining (3) Interacting roles of statistical learning and data mining. Statistical data structures and dimension reduction, visualization and exploration, Multidimensional scaling, classification methods, decision trees, neural networks, association rules and market basket analysis. Cluster analysis, Bayesian clustering, evaluation and selection of models and information criterion. Boosting and bagging. Support vector machines, optimization, search methods, and algorithms. Prereq: 564, 579 or equivalent, and knowledge of programming language, or consent of instructor.

677 Statistical Modeling (3) Modern techniques of statistical modeling: predictive, likelihood, Bayesian, and information-based model selection and evaluation paradigms. Application of techniques in various types of models for both continuous and discrete data modeling problems, interactive computational tools. Prereq: 564 and 572 or 538, 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, multivariate cluster analysis, common principal component model, factor analysis model, covariance structural models with latent variables, mixture-models and cluster analysis. Prereq: Matrix algebra and 564, or matrix-based linear models with experience in interactive computing, or consent of instructor.

683 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

691 Graduate Seminar in Applied Statistics (3) Reading of literature and discussion of open problems of importance to industry; design of experiments, modeling, process control, regression, and reliability. Prereq: Consent of instructor. S/NC or letter grade.

693 Independent Study (1-6) Directed research on subject of mutual interest to student and faculty member. May be repeated. Maximum 6 hrs.

Theatre
(College of Arts and Sciences)

MAJOR

THEATER

DEGREE

M.F.A.

Blake Robison, Head

Professors:

Black, W., M.F.A. ......................... Illinois
Custer, M., M.F.A. .......................... Wisconsin
Lester, L. W., Ed.D. ...................... Tennessee

Associate Professors:

Craven, E. H., M.F.A. ...................... Tennessee
DeCuir, L. (Laison), M.F.A. ................ Tulane
Gould, B. K., M.F.A. ........................ Catholic
Weber, T., M.F.A. ............................ Alabama

Assistant Professors:

Gabriel, D., M.F.A. ........................ Ohio State
Heil, M., M.F.A. ............................. Texas
Speas, B., M.F.A. ........................... Virginia
Van den Berg, Klaus, Ph.D. .............. Indiana
Yeager, K., B.F.A. .......................... Penn State

The Department of Theatre offers the Master of Fine Arts degree with a major in Theatre, concentrations in costume design, performance, lighting design, scenic design, and theatre technology. Not all areas of concentration accept applicants every year. UT Theatre maintains an active presence on the international theatre scene through the engagement of distinguished guest artists, touring to foreign theatre festivals, participation in international conferences, and other educational initiatives.

Applicants must have completed undergraduate degrees approximately equivalent in requirements to those specified for degrees conferred by The University of Pennsylvania. Three letters of recommendation and interviews with appropriate faculty are required of all applicants. Applicants for admission to the M.F.A. design/technical theatre programs must submit samples of their work. Auditions are required of M.F.A. degree performance 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. Three additional hours at the 500 level are required from history, literature, or dramaturgy. Students in the M.F.A. degree program are evaluated annually by juried 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 in the first year of residence.

Performance

At least 12 hours each of 520 Master Class in Performance: Acting; 523 Master Class in Performance: Movement; and 525 Master Class in Performance: Voice.

Coursework in this concentration is conducted in a conservatory environment. In the third year, students are expected to intern with either the resident professional Clarence Brown Theatre Company or another regional professional theatre.

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 24 credit hours from the previous graduate program to the MFA degree with approval of the student’s committee, the Dean of the College of Arts and Sciences, and the Dean of Graduate Studies.

Any such credits applied from a previous graduate program would be from courses that are directly relevant to the student’s MFA curriculum and must have been earned within the time limit (6 years) established for completion of the MFA degree.

GRADUATE COURSES

401 Principles of Theatrical Design (3) Visual and structural relationships in theatrical design.

409 Stage Make-up (3) Study and problems in make-up design and application; character analysis. Prereq: Introduction to Theatre.

420 Special Studies in Acting (3) Content varies. Exercising in selected concentrated areas such as styles, techniques, approaches, etc., Shakespeare, movement, humor. Prereq: Advanced Acting and consent of instructor. May be repeated. Maximum 9 hrs.
425 Selected Musical Theatre Techniques (2) Study and practice of musical theatre material: dance and vocal work. May be repeated. Maximum 4 hrs.


440 Advanced Theatre Costume Design (3) Costume as expressive element in dramatic production. Prereq: 345 or consent of instructor.

445 Advanced Costume Construction (3) Advanced studies in construction technique, tailoring, vacuum forming, plastics, and cobbling. Prereq: 345 or consent of instructor.

446 Costume Patterning (3) Draping patterns for period costumes. Creatory and study of historic patterns 1500-1900. Prereq: 345 or consent of instructor.

450 Advanced Scenery Technology I (3) Study and practice of theatre woodworking; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

451 Advanced Scenery Technology II (3) 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 Scenery Technology III (3) Study and practice of stage rigging for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

454 Rendering (3) Techniques in monochrome and full color illustration of space and form. Prereq: Acquaintance with basic mechanical perspective and freehand sketching.

456 Scenery Painting (2) Introduction to materials, techniques, and principles of craft. Gaining skill and understanding through studio experience. Prereq: Consent of instructor.

457 Painting and Dyeing for the Theatre (3) Fibers, dyes and dye processes; color matching and distressing.

459 Projects in Costume Technology (1-3) Individualized studies in costume technology in theatre production. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

460 Projects in Technical Theatre (1-3) Problems of set design interpretation and execution. May be repeated. Maximum 9 hrs.

461 Special Problems in Lighting Design (3) Advanced problems in lighting design and theory. Prereq: 462. May be repeated. Maximum 9 hrs.

462 Advanced Lighting Design (3) Advanced problems in lighting design and theory. Prereq: 462 or consent of instructor.

464 Computer Assisted Design for Theatre (3) Advanced techniques in computer assisted design for theatre. Work with CAD, Computer Drawing, Graphics, and/or 3D Modeling software for presentation of theatrical designs. Specific content varies with semester. Admission by consent of instructor only. May be repeated. Maximum 9 hrs.

470 Playwriting (3) Advanced instruction in writing of plays. Prereq: Consent of instructor.

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

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

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

501 Introduction to Graduate Research in Theatre (3) Research tools and methods for theatre artist and scholar.

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

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 strategies of major playwrights, using variety of analytical approaches from Aristotelian to deconstruction.

520 Master Class in Performance : Acting (3) Master class in acting techniques. Theatre MFA students only. May be repeated. Maximum 18 hrs.

523 Master Class in Performance : Movement (3) Master class in movement techniques. Theatre MFA students only. May be repeated. Maximum 18 hrs.

525 Master Class in Performance : Voice (3) Master class in voice and speech techniques. Theatre MFA students only. May be repeated. Maximum 18 hrs.

536 Projects in Play Directing (3) Practical work in play direction 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 mores, architecture and furniture.


545 Millinery for the Stage (2) Pattern making and construction techniques for hats from antiquity to present. Prereq: Consent of instructor.

546 Advanced Costume Patterning (3) Advanced studies in patterning period costume. Development of historic patterns through flat pattern method. Prereq: 446.

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 studies in costume technology in theatre production. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


551-552 Structural Design for Stage (3,3) Application of advanced theatre technology and analysis of common building materials to design of safe stage scenery. Must be taken in sequence.

553 Projects in Scenic Design (1-3) Conception and completion of major projects, both hypothetical and actual, in scenic design. May be repeated. Maximum 9 hrs.

554 Studies in Scenic Design (3) Advanced scene design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 6 hrs.

555 Model Building (3) Techniques of model building for scenic designer. Theatre MFA students only. Prereq: 401 and one semester of S&BC.

556 Drafting (3) Drafting techniques for scenic designer. Theatre MFA students only. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

560 Projects in Lighting Design (1-3) Conception and completion of major projects, both hypothetical and actual, in lighting design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

562 Special Problems in Lighting Design (3) Advanced problems in lighting design and theory. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

580 Design and Technical Production Seminar (1-6) Selected aspects of design and technical production. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

581 Technical Design (3) Technical problems and solutions in scenic construction using traditional and modern techniques with application of unusual materials, consideration of budgeting, safety, and structural integrity. Prereq: 551-552.

582 Production Planning (3) Theatre management techniques useful in structuring orderly, effective production: survey of applicable computer programs.

583 Stage Machinery (3) Design of safe, effective machinery for movement of stage scenery. Prereq: 551-552.

585 Production Workshops (1-6) Directed experience in production collaborations. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

599 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 18 hrs.
Art Education

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>510</td>
<td>History and Philosophy of Art Education (3)</td>
<td>United States from 1860 to present. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>520</td>
<td>Studies in Art Education (3)</td>
<td>Issues and topics current to the field of art education. 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>Use and Construction of Instructional Materials for Teaching Art (3)</td>
<td>Examination and construction of curriculum and instructional aids related to teaching strategies in art education.</td>
</tr>
</tbody>
</table>

Early Childhood Education

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>445</td>
<td>Early Childhood Education: Program Development and Teaching in Kindergarten (3)</td>
<td>Curriculum planning and implementation; principles of teaching and learning; assessment issues.</td>
</tr>
<tr>
<td>471</td>
<td>Early Childhood Special Education (6)</td>
<td>Assess-ment, curriculum planning and development and teaching approaches used in early childhood special education. Prereq: Admission to teacher education. E</td>
</tr>
<tr>
<td>515</td>
<td>Seminar (1-3)</td>
<td>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</td>
</tr>
<tr>
<td>554</td>
<td>Assessment in Early Childhood Special Education (3)</td>
<td>Development of knowledge and skills in appropriate formal and informal assessments of handicapped infants and young children; screening, identification, diagnosis, placement and programming assessment issues. Prereq: 553 or consent of instructor.</td>
</tr>
<tr>
<td>566</td>
<td>Curriculum for Early Childhood Education (K-3) (3)</td>
<td>Theoretical foundations and current research in content and skill areas of curriculum for kindergarten-grade 3; application to local school setting. Prereq: Content of instructor. May be repeated. Maximum 9 hrs. Sp,Su</td>
</tr>
<tr>
<td>567</td>
<td>Application of Theory in Early Childhood Education (K-3) (3)</td>
<td>Principles and practices from selected theoretical orientations. Prereq: Course in early childhood education or consent of instructor. May be repeated. Maximum 6 hrs. F,Su</td>
</tr>
<tr>
<td>568</td>
<td>Early Childhood Special Education: Theories and Interventions (3)</td>
<td>Theoretical perspectives of early childhood special education; exploration of programmatic models, family-focused concepts and curriculum development.</td>
</tr>
<tr>
<td>650</td>
<td>Advanced Studies in Early Childhood Education (3)</td>
<td>Prereq: 2 graduate courses in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E</td>
</tr>
</tbody>
</table>

**Elementary Education**

**Note:** See Mathematics, Reading, Science, and Social Science Education for additional Elementary Education courses.

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<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 social studies. Prereq: Admission to teacher education. F,Sp</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 oracy (listening and speaking) and aspects of literacy (reading process/readiness and writing). Not open to students with recent course in language arts methods. Prereq: Admission to teacher education. F,Sp</td>
</tr>
<tr>
<td>504</td>
<td>Studies and Theory in Language Development (3)</td>
<td>Studies and theory of language development in children. Prereq: 1 elementary school language arts course or consent of instructor. F</td>
</tr>
<tr>
<td>505</td>
<td>Elementary and Middle School Teaching Methods II (6)</td>
<td>Applied methods of teaching reading, language arts, science, social studies and mathematics: accommodation strategies for students with diverse needs. Prereq: Elementary and Middle School Teaching Methods I. Coreq: 576. F</td>
</tr>
<tr>
<td>523</td>
<td>Diagnosis and Correction of Children’s Difficulties in Learning Mathematics (3)</td>
<td>Children’s difficulties in learning mathematics and procedures for helping classroom teacher correct difficulties. Prereq: 522 or equivalent or consent of instructor. Sp</td>
</tr>
<tr>
<td>527</td>
<td>Elementary School Curriculum (3)</td>
<td>Examination, evaluation and application of curriculum designs in elementary school. Trends and issues which affect elementary education. Prereq: Consent of instructor. F,Sp</td>
</tr>
<tr>
<td>528</td>
<td>Teaching Language Arts Elementary and Middle School (3)</td>
<td>Recent trends and current methods in teaching elementary language arts (except reading). Prereq: Course in language arts or consent of instructor. Sp,Su</td>
</tr>
<tr>
<td>529</td>
<td>Practicum in Diagnosis and Remediation of Difficulties in Learning Mathematics (3)</td>
<td>Assessment and practicum experience with children having difficulties in learning elementary school mathematics. Prereq: 523 or consent of instructor. Su</td>
</tr>
<tr>
<td>550</td>
<td>Assessment and Correction of Language Arts Difficulties (3)</td>
<td>Procedures and materials for diagnosing and correcting language arts difficulties; analysis of children’s work. Prereq: Elementary school language arts course or consent of instructor. Su</td>
</tr>
<tr>
<td>606</td>
<td>Research in Elementary Education (3)</td>
<td>Analysis of research in elementary education with application to classroom teaching. Prereq: Research course. Su</td>
</tr>
<tr>
<td>651</td>
<td>Advanced Studies in Elementary School Language Arts (3)</td>
<td>Elective issues in elementary school language arts. Prereq: Graduate course in elementary school language arts or consent of instructor. Sp</td>
</tr>
</tbody>
</table>

**English Education**

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
<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>
<tr>
<td>507</td>
<td>Teaching Poetry Grades 7-12 (3)</td>
<td>Research and theory in application to teaching of poetry. Design of approaches and materials for teaching and reading of poetry. Review of texts and materials. Sp</td>
</tr>
</tbody>
</table>
| 508 | Teaching Composition in the Secondary School (3) | Teaching narrative, description, exposition, and
argumentation; writing process and marking of student papers. Sp

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

521 Interdisciplinary Aesthetics (3) Discussions, visual and audio presentations concerned with aes-
ergetic considerations of areas of study: geography, history, physics, literature, languages, music, visual arts and drama.

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

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

597 Teaching Drama Grades 7-13 (3) Strategies and materials for teaching creative dramatics, enacting
performance tasks, portfolios, exhibitions. Prereq: 485 or equivalent. Sp, A

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

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

Foreign Language/ESL Education

GRADUATE COURSES

455 Teaching of Foreign Languages, Grades 7-12 (3) Instructional methods, lesson planning, peer-teach-
ing; materials for teaching foreign language and culture; evaluation techniques. Required for certification in modern foreign languages and Latin. Prereq: Completion or near completion of foreign language hours for certification and Admission to teacher education. Su

555 Foreign Language in the Elementary Schools Practicum (3) Experiences designing, implementing and assessing second language instruction in elementary school setting. Prereq: 587 or consent of instructor.

556 English as a Second Language Practicum (3) Experiences designing, implementing and assessing English instruction to non-native English speakers. Required course for ESL certification. Prereq: 578 or consent of instructor.

578 Teaching English as a Second Language (3) Instructional methods; utilization of assessment procedures to diagnose English linguistic proficiency; materials for non-native speaker in K-12 classroom. Required for Tennessee ESL (K-12) licensure. Prereq: 587 or consent of instructor. Sp

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

678 Advanced Studies in English as a Second Language (3) Research, curricula, assessment, trends and issues in English as a second language. Prereq: 578 or consent of instructor. Sp

687 Advanced Studies in Foreign Language Education (3) Research, curricula, assessment, trends and issues in foreign language education. Prereq: 587 or consent of instructor.

Mathematics Education

GRADUATE COURSES

485 Teaching Mathematics, Grades 7-12 (3) Preparation of teaching plans, evaluation, materials for teaching mathematics; teaching simulation and dialectics of teaching plans, evaluation, materials for teaching middle school mathematics. F, S, A

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

605 Organizing and Administering Reading Programs (3) Diagnostic and teaching children having developmental and corrective reading needs in regular classroom. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. Sp

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. F

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

538 Practicum in Diagnosis of Reading Problems (3) Application of learning and teaching method-
ology 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. Sp

540 Teaching the Struggling Adolescent Reader (3) Methods of teaching middle and high school students who do not have sufficient reading skill to successfully engage in required reading. Prereq: Course in reading education, or equivalent teaching experience, or consent of instructor.

554 Developmental Reading Practicum (3) Diagnos-
ing and teaching children having developmental and corrective reading needs in regular classroom. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. Sp

561 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

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, Su

533 Reading in Community College: Research and Theory (3) Analysis of components of effective community college reading programs. Attention to research bases. Prereq: Course in reading education or consent of instructor. Su

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

Reading Education

GRADUATE COURSES

430 Elementary and Middle School Developmental Reading Instruction (2-3) Word recognition (including phonics), comprehension, evaluation, and materials. Not open to students with recent course in reading methods. Prereq: Admission to teacher education. F, Sp

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

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

500 Mathematics Curriculum (3) Past, present and future issues influencing mathematics curriculum in schools, elementary through college. Teacher's role in curriculum development and implementation. Ration-
ales for curriculum decisions. Prereq: 485, Elementary Education 505, or equivalent. Su

583 Teaching Mathematics in Senior High Schools and Community Colleges (3) Topics appropriate for high school and community/junior college mathematics curriculum. Special problems related to enrich-
ment problem solving, and use of microcomputers. Opportunities for special projects. Prereq: 485 or equivalent. Sp, A

683 Advanced Studies in Mathematics Education (3) Analysis of current research in mathematics edu-
cation and implications of research for classroom practice. Prereq: Two graduate courses in mathematics education.

Science Education

GRADUATE COURSES

496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education programs for secondary schools. Prereq: Admission to teacher education. F

506 Science Education Studies in Natural Environ-

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. Su

565 Instructional Trends and Issues in Science Education (3) Analysis of current trends in science instruction, instructional issues facing elementary, secondary, and community college science teachers, and application of learning theory to teaching biological, physical, and environmental sciences. Prereq: 496, teaching methods, or equivalent. Su

572 Nature of Mathematics and Science Education (3) Teaching and assessment of mathematics and science based upon student conceptions of nature of mathematics and science. Su

596 Curriculum Trends in Science Education (3) Analysis of elementary and secondary curriculum
### Social Science Education

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>454</td>
<td>Teaching Strategies and Issues in Social Studies (3) Goals, objectives, techniques, materials, and evaluation; directed observation in public schools, preparation of teaching plans and materials; simulated teaching experiences. Prereq: Admission to teacher education.</td>
<td></td>
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</tr>
<tr>
<td>521</td>
<td>Teaching Secondary School Social Studies (3) Analysis of new and innovative social studies program materials and techniques. Exploration of current trends in social studies education. Prereq: Previous course in teaching of social studies or consent of instructor.</td>
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<tr>
<td>559</td>
<td>Seminar in Social Studies Education (3) Research, trends, and issues in secondary social studies.</td>
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<tr>
<td>621</td>
<td>Seminar in Social Studies Research and Theory (3) Status of research and theory. Needed research, related research from other fields, and application of research. Prereq: Recent course in teaching of social studies or consent of instructor.</td>
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</table>

### Special Education

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>419</td>
<td>Psychology and Education of Students with Mild Disabilities (6) Nature and characteristics of persons with mild handicaps and educational strategies appropriate for these persons. Prereq: Special Education Principles, Special Education Strategies, and admission to teacher education program. Coreq: 420. F</td>
<td></td>
<td></td>
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<tr>
<td>420</td>
<td>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, and admission to teacher education program. Coreq: 420. S/N only.</td>
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<tr>
<td>431</td>
<td>Field Experience in Comprehensive Programs (3) Prereq: Recent course in Principles, Special Education Strategies, and admission to teacher education program. Coreq: 430. S/N only.</td>
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<tr>
<td>432</td>
<td>Psychology and Education of Students with Moderate/Severe Disabilities (6) Nature and characteristics of persons with moderate/severe disabilities and educational strategies appropriate for those persons. Prereq: Special Education Principles, Special Education Strategies, and admission to teacher education program.</td>
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</tr>
<tr>
<td>454</td>
<td>Education of the Gifted and Talented Children (3) Orientation to psychometric and behavioral studies of giftedness. Analysis of past and present school grant in reference to curriculum and program implementation. Sp</td>
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<tr>
<td>456</td>
<td>Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; understanding of speech and language development; problem solving; identification of oral/written communication skills into existing curriculum, especially for high incidence special education students.</td>
<td></td>
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<tr>
<td>470</td>
<td>Psychology of the Exceptional Child (3) Varieties of exceptionalities and educational needs. Implications of developmental variations for functioning as adults. Opportunity to expand study upon particular exceptionality. Enrollment limited to non-special education majors.</td>
<td></td>
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<tr>
<td>504</td>
<td>Clinical Experience in Teaching and Supervision of Exceptional Children (3-9) Placement in educational settings. May be repeated. Maximum 9 hrs. S/NC or letter grade. (Same as Rehabilitation and Deafness 504.)</td>
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<tr>
<td>506</td>
<td>Internships in Teaching in Special Education and Rehabilitation (3-15) Placement in professional settings in public schools or agencies under supervision of master practitioners. Enrollment limited to those in fifth-year program. S/NC only.</td>
<td></td>
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<tr>
<td>553</td>
<td>Assessment of Exceptional Students (3) Current issues related to assessment; advanced study of evaluation models for special education; dynamic and other alternative assessment approaches; introduction to study of application to educational programming; basic statistics and application in assessment.</td>
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<tr>
<td>555</td>
<td>Characteristics of Affective/Motivational Functioning in Children with Disabilities (3) Definition, measurement, identification and symptoms of children with affective/motivational development in disabled younger. Comparison to normal development and that of children labeled disturbed or behavior disordered.</td>
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<tr>
<td>556</td>
<td>Instructional Systems for Affective/Motivational Functioning in Children with Disabilities (3) Educational strategies and models of instruction; simulation, demonstration, and media. Teaching techniques, materials, and teacher/pupil/family interactions. Therapeutic forms of education through art, music, role play, puppetry, bibliotherapy, and group interactions. Prereq or coreq: 555 or consent of instructor.</td>
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<tr>
<td>557</td>
<td>Positive Preventive Discipline (3) Instructional classroom and preventive/protective strategies for use in classroom which positively effects efficiency of classroom. Research on how curriculum can encourage appropriate interactions of children and youth. Prereq: Admission to graduate program.</td>
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<tr>
<td>564</td>
<td>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.</td>
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<tr>
<td>565</td>
<td>Instructional Systems for the Gifted and Talented Child (3) Instructional systems calibrated in terms of efficiency in various educational environments. Prereq or coreq: 564 or consent of instructor.</td>
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<tr>
<td>575</td>
<td>Creative Problem-Solving Strategies for Special Education Students (3) Students encountered by special educators in any setting.</td>
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<td>586</td>
<td>Seminar in Research Techniques in Special Education (3) Evaluation of appropriate research methodologies with handicapped populations.</td>
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<tr>
<td>590</td>
<td>Application of Microcomputer Technology in Special Education and Vocational Rehabilitation (3) Application of microcomputer technology with all categories of exceptionalities and across all chronologic and functioning age ranges. Microcomputer adaptations, software, speech output, telecommunications, and strategies for cognitive development.</td>
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</tbody>
</table>

### Theory and Practice in Teacher Education

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>500</td>
<td>Thesis (1-15) P/NP only. E</td>
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<tr>
<td>502</td>
<td>Registration for Use of Facilities (1-15) Requires an application for facilities used by 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 or letter grade.</td>
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<tr>
<td>503</td>
<td>Problems in Lieu of Thesis (2-3) May be repeated. Maximum 9 hrs. S/NC or letter grade. (Same as Rehabilitation and Deafness 503)</td>
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<tr>
<td>517</td>
<td>Trends and Issues in Education (3) Examination of contemporary trends and issues in education.</td>
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<td>518</td>
<td>Educational Specialist Research and Thesis (3) May be repeated. P/NP only. E</td>
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<tr>
<td>526</td>
<td>Drama and Story Telling in Teaching (3) Use of techniques of drama and storytelling to improve impact of teaching and to teach more effectively. Prereq: Classroom experience or admission to teacher education program.</td>
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<tr>
<td>550</td>
<td>Action Research and Practical Inquiry in Education (3) Principles of action research and practical inquiry for practitioners in early childhood and school settings and methods for conducting such inquiries in professional role. Prereq: Admission to graduate program.</td>
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<td>593</td>
<td>Independent Study (1-3) May be repeated. S/NC or letter grade. E</td>
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<td>594</td>
<td>Supervised Readings (1-3) May be repeated. S/NC or letter grade. E</td>
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<td>595</td>
<td>Special Topics (1-3) May be repeated. S/NC or letter grade. E</td>
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<td>596</td>
<td>Clinical Experience in Assessment and Instruction (3) Academic remediation applied in lab/field setting; tasks related to teaching; assessment, preparation of lessons, and delivery of instruction. Coreq: 553. S/NC or letter grade. F</td>
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<tr>
<td>600</td>
<td>Doctoral Research and Dissertation (3-15) P/NP only. E</td>
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<tr>
<td>604</td>
<td>Seminar in Curriculum and Instruction (1) Required 2 consecutive semesters. S/NC only. E</td>
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<tr>
<td>610</td>
<td>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.</td>
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<tr>
<td>617</td>
<td>Trends and Issues in Teacher Education—An Interdisciplinary Perspective (3) Current trends and issues in field of teacher education: elementary education, mathematics education, science education and social science education. Prereq: Admission to doctoral program or consent of instructor. Sp</td>
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<tr>
<td>620</td>
<td>Research in Literacy, Language, and ESL Education (3) Recent trends and historical traditions in language and literacy research: analysis of nature of research methods used, questions asked and topics</td>
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</table>
Planning.

Accreditation Board, a joint undertaking of consulting. Development problems; and in private business and organizations dealing with agencies concerned with physical, environmental, regional, city, county, and metropolitan planning. Graduates are candidates for positions in urban and regional planning or related fields.

The Department of Urban and Regional Planning offers a program of courses leading to the professional degree of Master of Planning. The Master's Program offers a program of courses leading to the professional degree of Master of Planning. The program is designed to provide a comprehensive understanding of the principles and practices of planning and to prepare students for careers in planning.

The M.S.P. program is available to residents of the states of Arkansas, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

**Transportation**

See Marketing, Logistics and Transportation.

**Urban and Regional Planning**

(College of Arts and Sciences)

**MAJOR**

**DEGREE**

Planning ............................................. M.S.P.

C. W. Minkel, Head

Professors:


Associate Professor:

Tonn, Bruce, Ph.D. .......................... Northwestern

Assistant Professors:

Jeppson, Edward, Ph.D. ................. Wisconsin Shupp, Teresa, M.S.P. .......................... Tennessee Zanetta, Maria C., Ph.D. ................. Ohio State

The Department of Urban and Regional Planning offers a program of courses leading to the professional degree of Master of Science in Planning. The degree is the normal route for entry into professional positions in urban and regional planning or related fields. Graduates are candidates for positions in regional, city, county, and metropolitan planning agencies; in local, state, and federal agencies concerned with physical, economic, and administrative planning; in private business and organizations dealing with development problems; and in private consulting.

The Master of Science in Planning program is accredited by the Planning Accreditation Board, a joint undertaking of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning.

**THE MASTER'S PROGRAM**

**Admission Requirements**

Applicants are to submit an application for admission to the Office of Graduate Admissions and two letters of reference from faculty familiar with their prior academic work and a statement describing personal career objectives directly to the department. 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. Students who have not taken an appropriate undergraduate statistics course will be required to take one.

**Degree Requirements**

The M.S.P. requires completion of at least 48 hours of graduate credit, at least 30 of which must be in planning. The following courses are the core curriculum required of all students: 510, 515, 520, 521, 530, 531, 532, 538 and 540.

Students should plan to enter the program in the fall term to take 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 courses from a prescribed set in the subject area. Further enhancement of the concentration is gained by focusing the thesis or major study 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, environmental planning, real estate development, and transportation 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 demonstrate competence in individual research. This may be done in one of two ways:

**Thesis Option:** Complete a thesis for 6 hours credit.

**Non-Thesis Option:** Complete a major study with acceptable documentation. To be eligible for the major study option, the student must have completed at least 12 hours of graduate coursework in planning with at least a 3.5 cumulative grade-point average. The student meeting these criteria may present a proposal to his/her committee for a major study that will include at least 6 hours of subsequent coursework. The proposal must justify the selection of the topic, describe the approach to the study, and describe the nature of the final product. The topic will normally be expected to reinforce or complement the student's concentration.

Successful completion of a comprehensive exam is required before graduation. The exam will normally be taken after completion of the core requirements in the second year. Based on the material generally used by the American Institute of Certified Planners (AICP), this requirement provides an additional capstone experience as well as preparation for meeting AICP professional certification requirements.

**Student academic progress is monitored by the faculty.** A student failing to maintain an acceptable grade-point average may be placed on probation or dismissed from the program.

**MINOR IN ENVIRONMENTAL POLICY**

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

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT on an in-state tuition basis. The M.S.P. program is available to residents of the states of Arkansas, Virginia, or West Virginia. Additional information may be obtained from the Administrative Services Assistant in the Office of Graduate Admissions.

**Planning**

**GRADUATE COURSES**

401 The City in the U.S. (3) Development and character of U.S. cities. Contemporary issues and selected case studies. (Same as Urban Studies 401.)


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

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

510 Fundamentals of Planning (3) History of planning, structure and development of urban areas, operations of contemporary planning, trends and issues.

515 Theory of Planning (3) Analysis of nature and objectives of planning process; role of planner and planning function in public decision-making. Prereq: 510 or consent of instructor.

520 Planning Research Methods (3) Overall structure of occupational research in planning practice; familiarity with structure of planning literature information sources, systematic retrieval techniques, processes and tools, practice posing research questions relevant to planning.

521 Information Systems and Networks in Planning (3) Use and impact of computer-based information systems and global networks in planning and public management. Development of practical skills in design of planning decision-support systems, databases, Internet based tools and geographic information systems (GIS). Prereq: Basic experience with computer software and hardware or consent of instructor.

530 Planning Policy Analysis (3) Basic methods of policy analysis and planning. Economic factors underlying the dynamics of change in cities and regions. Coreq: 520 or consent of instructor.

531 Land Use Analysis (3) Concept and framework for land-use analysis. Population, employment, economic base studies and forecasting techniques.

532 Planning Methods (4) Preparation of comprehensive plans for urban areas or regions. Development of baseline data and forecasts, formulation of alternative plans and strategies, and development of plan implementation programs. Extensive laboratory experience. Prereq: 510, 520, 530 and 531 or consent of instructor.

537 Planning and Transportation (3) (Same as Civil Engineering 558.)

538 Urban and Site Design (3-6) Principles of design of residential subdivisions and some components of physical community, shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience.

539 Planning for Historic Preservation (3) Planning for preservation, restoration, and conservation of historic buildings, areas and sites as related to comprehensive planning process. National, state, and local government role in preservation. Designation of historic sites and legislative needs, financing and administrative organizations.

540 Legal Aspects of Planning (3) Legal basis for planning and development. Legal tools of planning. Prereq: 510 or consent of instructor.

543 Cultural Resources Planning (3) Cultural characteristics creating identity and spirit of place; role in environmental and land-use planning; use in protection of natural environment and cultural heritage. Cultural components of National Environmental Protection Act and case studies.

545 Planning and Property Development (2) Process of urban physical growth and change; functioning of private sector real estate development and the relationship to planning. Partnership roles of public and private sectors in urban development and redevelopment. Prereq: 510 or consent of instructor.

547 Negotiation (1) Methods, strategies, techniques and skills for analyzing and resolving conflict. Resolution of policy issues and dispute resolution concerning urban planning and development.

548 Tourism Planning (3) Planning of tourist resources and programs within a geographic region. Tourism planning models. Relationships among tourists, tourism developments and planning of tourist attractions and services. Application of techniques in selected areas.


552 Development Planning in the Third World (3) Seminar on urban and regional development in Third World nations. Population growth, settlement patterns, economic development, land framework of integrated resource management. (Same as Ecology and Evolutionary Biology 552.)

553 International Planning (3) Alternative development models. Comparative analysis of planning processes and policies around world. Population growth, urbanization, environmental degradation, and economic development in developing countries.

555 Environmental Planning (3) Role of planners and planning in maintenance of balance between natural and built environment. (Same as Ecology and Evolutionary Biology 555.)

556 Futures Planning (3) Overview of world and community futures literature. Skills in trends assessment, scenario writing, and other futures planning techniques.

560 Strategic Planning & Policy Development (3) Models of strategic planning and process of policy development in applied decisions making. Qualitative approaches, program evaluation and impact assessment.

560 Practicum (3) Prereq: Consent of instructor. S/N or letter grade.

591 Special Topics (1-3) Prereq: Consent of instructor.

592 Readings in Planning (1-3) Prereq: Consent of instructor. May be repeated.

593 Problems in Planning (1-3) Prereq: Consent of instructor.

VETERINARY MEDICINE

College of Veterinary Medicine

MAJOR

DEGREE

Veterinary Medicine .................................. D.V.M.
Comparative and Experimental Medicine .......... M.S., Ph.D.

THE PROFESSIONAL PROGRAM

Admission Requirements

To qualify for admission to the professional program of the College of Veterinary Medicine, a candidate must have completed at least the minimum preveterinary course requirements listed below. These may be completed at any accredited college or university that offers courses equivalent to those at The University of Tennessee.

Preveterinary course requirements must be completed by the end of spring term of the year in which the student intends to enroll. Students must be enrolled at the time the applicant wishes to enter the program.

Subject Area Semester Hours

English 6
Humanities and Social Sciences* 18
Physics 8
General Chemistry 8
Organic Chemistry 8
Biochemistry** 4
General Biology 8
Genetics 3
Cellular Biology*** 3
TOTAL 66

*May include, for example, courses in English literature, speech, music, art, philosophy, religion, language, history, economics, anthropology, political science, psychology, sociology and geography.

**Exclusive of laboratory.

***It is expected that this requirement will be fulfilled by a course in cellular or molecular biology.

Admission Procedures

Admission of new students is for the fall semester, with first priority given to residents of Tennessee.

The College of Veterinary Medicine utilizes the Veterinary Medical College Application Service (VMCAS) for all applicants. Forms and instructions for making application for admission may be obtained beginning June 1, 2002 from the Office of the Associate Dean, The University of Tennessee, College of Veterinary Medicine, 2407 River Drive, Room A102, Knoxville, TN 37996-4550.

Note: The deadline for receipt of the completed application materials is November 1. NON- TENNESSEE APPLICANTS MUST HAVE A MINIMUM CUMULATIVE GRADE-POINT AVERAGES OF 3.2 ON A 4.0 SCALE FOR APPLICATION TO BE CONSIDERED.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

D.V.M. Curriculum

The curriculum of the College of Veterinary Medicine is a nine-semester, four-year program. Each class begins in August and graduates four years later in May. The first three years generally 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 54 weeks.

Development of a strong basic science foundation is emphasized in the first year. Courses consist mostly of preclinical subjects of anatomy (gross and microscopic), physiology, immunology, bacteriology, virology and parasitology. Also included in the first year are clinical subjects of physical diagnosis and special diagnostics. 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 participate exclusively in clinical rotations in the Veterinary Teaching Hospital and in required externships (preferably off-campus).

Innovative features of this curriculum include: six weeks of student centered, small group, applied learning exercises in semesters one through five; three weeks of dedicated clinical experiences in the Veterinary Teaching Hospital in semesters three through five; and elective course opportunities in semesters four, five and six which allow students to focus on individual educational/career goals. Students enrolled in the D.V.M. program may register for up to 10 credit hours of graduate courses and these hours will be credited toward the D.V.M. degree. Elective study offers a unique educational alternative for students in the CVM and is intended to enhance professional growth, concentration in an area of interest and career opportunities.

In addition to education in the science and art of veterinary medicine, students receive instruction in paramedical subjects such as animal behavior, medical communication, professional ethics, jurisprudence, economics, and practice management.

The curriculum requires successful completion of 163 semester credits.

THE GRADUATE PROGRAM

The College also administers a graduate program involving all departments which leads to the Master of Science and the Doctor of Philosophy degrees. 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,
ogy, genetics and animal management), Microbiology (bacteriology, virology and immunology), Ecology and Evolutionary Biology (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/or research careers in the health sciences.

**PROFESSIONAL COURSES**

801-02-03 Application Based Learning Exercise (ABLE) I, II, III (2,2,2) Small group, student-centered learning sessions with faculty facilitator for self discovery of new information. Week-long sessions based on specific clinical case or problem, and integration of basic science and clinical material. S/NC only.

804-05-06 Application Based Learning Exercise (ABLE) and Clinical Exposure I, II, III (2,2,2) Week-long small group learning sessions with faculty facilitator for self discovery of new information based on specific clinical case or problem; integration of basic science and clinical material. One week of clinical experience through participation in specific clinical rotations in Veterinary Teaching Hospital. S/NC only.

811 Infection and Immunity II—Bacteriology and Mycology (3) Fundamental aspects of microbiology and cell biology relative to pathogenesis of bacterial and fungal diseases of animals: antimicrobial actions and mechanisms of bacterial resistance. General approaches to diagnosis, treatment and prevention.

813 Infection and Immunity I—Immunology (2) Basic biology and practical aspects of immunology: cells of immune system, immune function and dysfunction, immunological basis of diagnostic testing and specific diseases involving immune system.

814-16 Clinical Correlations and Ethics I, II, (1,2) Correlations between basic science material from concurrent courses and practice of veterinary medicine. Thought-provoking discussion of current veterinary ethical issues. 816—Student-led discussions follow faculty presentations.


821-22 Veterinary Anatomy I, II (6,6) Integrated approach to study of developmental, macroscopic (gross), and microscopic anatomy of common domestic animals. Dissections of embalmed specimens of common domestic species for comparative purposes. Microscopy relates structure with function. Study of development. Anatomy related to normal anatomy to inherited anomalies.

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, and surgery. Cellular, neural, cardiovascular, renal, respiratory, digestive, endocrine, and reproductive physiology.

827 Special Problems in Animal Science (1-8) Extramural and specially designed study for students interested in select topics in anatomy, histology, and physiology.

831 Physical Diagnosis (1) Basic care, feeding, restraint, and handling domestic animals. Introduction to physical examination and diagnostic techniques used by veterinarians.

832 Anesthesiology (2) Principles of anesthesiology: pharmacology of anesthetics, and introduction to anesthetic techniques in veterinary medicine.

833 Epidemiology and Evidence Based Medicine (2) Study of distribution and deterrents of disease in animal populations. Use of knowledge (evidence) gained from management of clinical patients in past to improve future clinical decision making processes.

834 Hematopoietic System (2) Pathophysiology and diagnosis of disorders involving bone marrow and blood cells, platelets, and blood coagulation in domestic animals; interpretation of laboratory test results using illustrative clinical cases.

835 Principles and Practice of Surgery (2) Principles of veterinary surgery: aseptic technique, patient and surgeon preparation, control of surgical hemorrhage and infection, and general operation techniques. Proper methods of tissue handling, surgical instrumen-
tation, and selection of suture materials and suturing patterns. Pathophysiology of surgical and accidental wounds: wound healing and management.

836 Toxicology (2) Principles of toxicology, molecular mechanisms, pathologic processes and clinical features of animal diseases caused by common toxic agents.

837 Food Hygiene and Zoonoses (2) Host-agent relationships, public health aspects of veterinary medicine and role of veterinarians in ecology and food hygiene.

840 Integumentary System (3) Pathophysiology, special pathology, medicine and surgery of diseases of skin and integument. Laboratory examination, pathology, diagnosis and treatment.

841 Reproductive System (4) Pathophysiology, special pathology, medicine and surgery of diseases of males and female reproductive systems and mammary glands.

842 Alimentary System (4) Pathophysiology, special pathology, medicine and surgery of diseases of alimentary systems.

843 Musculoskeletal System I (3) Pathophysiology, clinical description and basic treatment modalities of common diseases and conditions of skeletal system of small animals: development of basic diagnostic and treatment skills.

844 Musculoskeletal System II (3) Pathophysiology, special pathology, medicine and surgery of diseases of muscular and skeletal systems. Advanced principles, radiographic interpretation and surgical procedures.

845 Veterinary Nutrition (2) Principles of nutrition, and nutrition of animals in health and disease. Applied nutrition relating to individual small or large animal, pet or to herd situations.

846 Multispecies Medicine (4) Anatomy, pathophysi-
ology, medicine, and surgery of avian species, laboratory and zoo animals and reptiles. Species and diseases seen by practicing veterinarian. Current topics on foreign animal diseases.

851 Urinary System (3) Pathophysiology, special pathology, medicine and surgery of diseases of urinary system. Urinary system in health and disease.

852 Cardiovascular System (2) Pathophysiology, special pathology, medicine and surgery of diseases of cardiovascular system. Anatomic, physiologic and pharmacologic principles which provide basis for treatment.

853 Endocrine System (2) Pathophysiology, medi-

854 Respiratory System (3) Pathophysiology, special pathology, medicine and surgery of diseases of respiratory system. Upper and lower respiratory sys-
tems: infectious and noninfectious diseases.

855 Radiology (3) Basic, advanced and special techniques in radiology with interpretation and use of radiologic and related techniques in diagnosis and treatment of animal disease.

856 Special Senses (2) Pathophysiology, special pathology, medicine and surgery of diseases of visual and auditory systems.

857 Nervous System (3) Pathophysiology, special pathology, medicine and surgery of diseases of nervous system: clinical neurology and neuropa-thology.

858 Neurology/Opthalmology (4) Clinical training in specialty services: ophthalmology and neurology. Direct responsibility for diagnosis, patient care, and treatment of patients in both Large Animal and Small Animal Clinical Sciences.

861 Pharmacology I (2) Principles of pharmacokinetics and pharmacodynamic properties of veterinary drugs; mode of action and pharmacologic effects including important metabolic aspects, chemical and physical properties, side effects (toxicities) and clini-
cal application.

862 Pharmacology II (2) Continuation of 861: modes of action, pharmacologic effects, and clinical applica-
tion of drugs to control specific disease conditions.

864 Infectious Diseases (2) Pathogenesis and clinical findings of major viral, bacterial, and fungal infectious diseases of domestic animals: cattle, horses, swine, sheep, goats, dogs and cats; relevant case-based presentations.

865 Clinical Rotation in Comparative Medicine (2) Clinical training in avian medicine, laboratory animal, and zoo animal medicine, epidemiology, public health, and other related disciplines.

867 Special Problems in Comparative Medicine (1-
8) Extramural and specially designed study for stu-
dents interested in select topics in avian medicine, laboratory animal medicine, zoo animal medicine, epidemiology, public health, pharmacology or toxicology.

868 Introduction to Animal Behavior (2) Basic principles of normal and abnormal animal behavior in domestic animals; clinical case discussions to illus-
trate common behavioral problems and current approaches to therapy.

870 Anesthesiology (4) Clinical training in sedation and anesthesia of companion animals, food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

871 General Pathology (3) Principles of pathobiology: causes of disease, disturbances of cell growth and inflammation.

873 Infection and Immunity IV—Parasitology (3) Principles of parasitology: protozoology, helminthol-

gy, and entomology and relationship to diseases in animals.

874 Oncology (2) Fundamental aspects of cell biology and pathobiology relative to etiology and natural behavior of various neoplasms of animals; general approaches to diagnosis, treatment and prevention of neoplasia.

877 Special Problems in Pathology (1-8) Extramural and specially designed study for students interested in select topics in morophologic pathology, clinical pathology, clinical microbiology and parasitology.

878-79 Elective Clinical Rotation I, II (2,2) Special rotations in applied clinical education in Small Animal Clinical Sciences, Large Animal Clinical Sciences, Comparative Medicine and Pathology. Novel experi-
ence not associated with required clinical rotations may be arranged.

881 Clinical Rotations in Small Animal Clinical Sciences I, II, III (2,3) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, care, and treatment of clinical patients.

882 Clinical Rotations in Small Animal Clinical Sciences II, III (2) Clinical training in medicine, surgery and specialty disciplines for companion animals. Di-
rect responsibility for diagnosis, care, and treatment of clinical patients.

883 Clinical Rotations in Small Animal Clinical Sciences IV, V (2) Clinical training in medicine, surgery and specialty disciplines for companion animals. Di-
rect responsibility for diagnosis, care, and treatment of clinical patients.

886-89 Clinical Rotation in Radiology and Pathol-

890 Clinical Rotation in Comparative Medicine I, II (2) Two weeks in each discipline. Clinical training in radiographic techniques and interpretation, including ultrasonography. Post-mortem examination and laboratory diagnostic procedures and introductory histopathology of biopsy specimens.

887 Special Problems in Small Animal Clinical Sciences (1-8) Extramural and specially designed
study for students interested in select topics in medicine, surgery, anesthesiology, radiology and medical specialties of small (companion) animals.

890 Transition and Accreditation Seminars (2) Discussion of USDA, state, and local animal laws and regulations: preparation of animal movement forms, veterinary ethics, jurisprudence, basic practice management, and other topics involved in practice of veterinary medicine.

891 Clinical Rotations in Large Animal Clinical Sciences I (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

892 Clinical Rotations in Large Animal Clinical Sciences II (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

893 Clinical Rotations in Large Animal Clinical Sciences III (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

897 Special Problems in Large Animal Clinical Sciences (1-8) Extramural and specially designed study for students interested in select topics in medicine, surgery, herd health, reproduction, radiology and medical specialties of large animals.

898-99 Externship I, II (2,2) Educational experiences in private practice, research facility, zoological preserve, aquarium, or other veterinary-related facility outside Veterinary Teaching Hospital; to provide experiences not frequently available in large referral veterinary teaching hospitals.