Fields of Instruction

Accounting and Business Law
(College of Business Administration)

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

Jan R. Williams, Head

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

Jan R. Williams, Head

Accounting Professors:
Dittrich, Norman E., CPA, Ph.D. ...... Ohio State
Herring, Hartwell C., III, CPA, Ph.D. ....... Alabama
Kiger, Jack E. (Warren L. Slagle Prof. of Acct), CPA, Ph.D. .......... Missouri
Read, W. H. (Emeritus), CPA, M.B.A. .......... Northwestern
Scheiner, James H., CPA, Ph.D. ............ Ohio State
Stanga, Keith G. (Distinguished Prof.), CPA, Ph.D. .......... Louisiana State
Williams, Jan R. (Ernst & Young Prof.), CPA, Ph.D. .......... Arkansas

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

Accounting Assistant Professors:
Gatian, Amy W., Ph.D. .......... VPI

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

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

THE MASTER OF ACCOUNTANCY PROGRAM

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

Admission Requirements
Application deadlines for international students are: Fall, March 1; Spring, July 15; Summer, November 15. Application deadlines for U.S. citizens and permanent residents are: Fall, June 1; Spring, October 1; Summer, February 1. Although the program is designed for students who have completed an accredited baccalaureate degree program with a major in accounting, those with outstanding undergraduate records in any area may earn the M.Acc. degree by completing prerequisites in accounting and by including courses in other business and related disciplines to supplement the applicant's undergraduate background. Students entering the program are expected to have completed coursework in calculus and computer science.

For students with no previous exposure to calculus, Mathematics 503 is available. In addition to the general admission requirements for The Graduate School, M.Acc. applicants are required to take the Graduate Management Admission Test (GMAT) and submit information on forms provided by the College of Business Administration. Applicants whose native language is not English must submit results of the Test of English as a Foreign Language (TOEFL).

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

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

Accounting Concentration (12 hours):
1. Financial/Auditing: 512, 531, 519, one accounting elective.
3. Taxation: 531, 532, 533, 539.

Non-accounting Electives (9 hours): Non-accounting courses taken in either other business or non-business areas, upon approval of M.Acc. advisor.

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

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

BUSINESS ADMINISTRATION

CONCENTRATIONS

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

MAJOR CONCENTRATION: Controllership.

The concentration in controllership provides added accounting skills appropriate for those seeking employment in the controllership or general management functions of a variety of organizations. Although the controllership concentration provides broad preparation for the Certified Management Accountants' examination, it is not designed to meet the minimum educational requirements to take the Certified Public Accountants' examination.

Minimum course requirements are three courses from the following: 504, 505, 522, 541.

Ph.D. Concentration: Accounting.

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

Minimum course requirements are 12 hours including 611, 612, 619, and one other accounting course to be approved by Ph.D. accounting program advisor.

ACADEMIC STANDARDS

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

GRADUATE COURSES


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

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


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


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

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

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

522 Budgetary Planning and Control Systems (3) Alternative approaches to form and use of planning and control systems to meet organizational objectives. Control systems and corporate structure, discretionary expense centers, profit centers, transfer pricing, and control in manufacturing, service, and not-for-profit organizations. Prereq: 521 or 503.

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

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

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

534 Unified Estate and Gift Taxation (3) Taxation of wealth transfers; transfers at death, intestates transfers, and generation skipping transfers. Income tax treatment of estates and trusts. Determination and payment of state and federal wealth transfer and income taxes. Prereq: 431.

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

541 Database Systems (3) Design, implementation, and use of database systems for collection, organization, and distribution of economic information about organizations. Prereq: 512 or 501; 321 or 503; 341 or Business Administration 506.

542 Systems Analysis and Design (3) Analysis and design of information systems for management and distribution of economic information about organizations. Prereq or coreq: 502 or 503, 541.

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

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

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

594 Graduate Seminar in Accounting (3) Topics vary.

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

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

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

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

Business Law

Professors:

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

Assistant Professors:

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

GRADUATE COURSES

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

Advertising

DEGREES

M.AJOR

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

Ronald E. Taylor, Head

Professor:

Taylor, Ronald E., Ph.D. ......... Illinois

Associate Professors:

Hovland, Roxanne, Ph.D. ............. Illinois

Jackson, DeForrest, M.S. .......... Tennessee

Stankey, Michael J., Ph.D. .............. Illinois

Assistant Professor:

Hoy, Maria, Ph.D. .............. Oklahoma State

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

GRADUATE COURSES

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

510 Advertising and Society (3) Analysis of advertising as applied to creative strategy decisions. Prereq: Consent of instructor or admission to program. Sp

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. F

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

550 Seminar in Advertising Issues (3) Sallent issues in advertising. Topics vary. Prereq: Consent of instructor or admission to program. May be repeated. Maximum 6 hrs. Su

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

598 Internship (3) Professional work in advertising supervised by advertising manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core courses. Su

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.

Roy R. Lessly, Head

Professors:

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

Associate Professor:

Lessly, Roy R., Ed.D. Oklahoma State

Assistant Professor:

Waters, Randal G., Ph.D. Penn State

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

THE MASTER'S PROGRAM

Thesis Option

A candidate for the Master's degree who elects the thesis option must successfully complete:

1. A minimum of 30 hours of graduate credit in courses approved by the student's advisory committee. Six hours of thesis may be counted toward this requirement.
2. A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.
3. A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.
4. A minimum of 3 hours of graduate credit in coursework in 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 non-thesis credit.
6. A written and oral comprehensive examination.

GRADUATE COURSES

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

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

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

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

522 Extension Teaching Methods (2) Teaching/learning methods and techniques applicable to extension work, interpersonal relationships and relative effectiveness.

Associate Professors:

English, B. C. Ph.D. ............... Iowa State Park, W. M., Ph.D. ............... VPI Roberts, R. K., Ph.D. ............... Iowa State

Assistant Professors:

Jensen, K. L., Ph.D. ............... Oklahoma State Pompelli, G. K., Ph.D. ............... California (Davis) VanTassell, L. W., Ph.D. ............... Texas A&M

THE DOCTORAL 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. Six hours of thesis may be counted toward this requirement. At least 24 hours of graduate credit must be earned in courses numbered at or above the 500 level. In the agricultural economics concentration, 12 hours of agricultural economics, 6 hours of economic theory and 6 hours of quantitative methods are required. In the rural sociology concentration, 12 hours in the department (9 hours rural sociology), 6 hours of sociological theory, 3 hours of research methods and 3 hours of statistics are required. Each student must successfully complete a final oral examination.

Non-Thesis Option

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

Minor

A minor will include 6 hours of coursework in the department, with at least 3 hours in 500- or 600-level courses. The student's committee must include a member of the faculty from the department who will be responsible for designating courses required for the minor.

GRADUATE COURSES

412 Agricultural Finance (3) Macroe- finance, financial objectives, acquisition of debt and equity funds, capital investments, capital allocation, credit analysis, borrower and lender loan application analysis, insurance strategies, computer applications, kinds and sources of agricultural credit, and financial intermediation. Prereq: Economics 201; junior standing or consent of instructor. F

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

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

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

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

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

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

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

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

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

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

522 Mathematical Programming Methods in Agricultural Economics (3) Application of mathematical methods to agricultural economic problems: linear programming, integer and quadratic methods; deterministic and stochastic models; determination of optimal solutions. Prereq: Statistics 241 or consent of instructor. F

540 Advanced Agricultural Production Economics (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 policy decisions on industry. Prereq: 440 or equivalent. Sp

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

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

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

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

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

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

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

650 Operations Analysis in Marketing (2) Components and functions of marketing system, levels of analysis and types of operations research, interpolation and competition. Prereq: 450 and 550 or consent of instructor. Sp, A
652 Consumer Demand and Food Consumption (2)
Simultaneity of consumer decision making; food demand; consumer demand, complete demand system models. Prereq: Economics 511 and 512 or consent of instructor. Sp,A

660 Seminar in Rural Economic Development (2)
Current topics in economic development of rural areas. Current literature, evaluation of theory, methodology and public policy as related to allocation of natural resources. Prereq: 570 or consent of instructor. Sp,A

670 Seminar in Natural Resource Economics (2)
Issues in natural resource economics. Current literature; evaluation of theory, methodology and public policy as related to allocation of natural resources. Prereq: 570 or consent of instructor. F,A

Rural Sociology

GRADUATE COURSES

480 Diffusion of Agricultural Technology (3)
Analysis of diffusion and communication processes whereby new technology spreads from scientists to change agents and then to farmers. Innovation-decision process; communication behavior, mass media, role of professional change agents, opinion leadership and consequences of technological change. Prereq: 360 or consent of instructor. (Same as Sociology 482.) 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: 360 or equivalent. (Same as Sociology 580.) Sp

593 Special Topics in Rural Sociology (1-3)
Current sociological issues involving application of sociological theory. Prereq: 360 or consent of instructor. May be repeated. Maximum 6 hrs. (Same as Sociology 595.) E

Agricultural Engineering

(College of Agricultural Sciences and Natural Resources)

MAJORS DEGREES

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

D. Houston Luttrell, Head
Bobby L. Bledsoe, Associate Head

Professors:
Bledsoe, B. L., PE, Ph.D. .......... Oklahoma State
Henry, Z. A., PE, Ph.D. ............ NC State
Luttrell, D. Houston, Ph.D. ........ Iowa State
McDow, John J., PE, Ph.D. ......... Michigan State
Mote, C. R., PE, Ph.D. ............. Ohio State
Sewell, J. L., PE, Ph.D. ............ NC State
Shelton, C. H. (Emeritus), M.S. ..... VPI
Tompkins, F. D., PE, Ph.D. ........ Tennessee
Wilhelm, Luther R., PE, Ph.D. ......... Tennessee

Associate Professors:
Grandle, George F., Ph.D. .......... Tennessee
Wills, James B., M.S. ............... Tennessee

Assistant Professors:
Baxter, D. O., M.S. .................... Missouri
Burcham, Timothy N., Ph.D. .......... Clemson

Buschermohle, Michael J., Ph.D. .......... Clemson
Freeland, Robert S., Ph.D. .......... Tennessee
Hart, W. E., Ph.D. ............... Purdue
Prather, Timothy G., M.S. .......... Georgia
Willkerson, J. B., Ph.D. .......... Purdue
Yoder, Daniel C., Ph.D. .......... Purdue

Graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Agricultural Engineering are available to graduates of a recognized curriculum in engineering, mathematics, or one of the physical or biological sciences. A graduate program leading to the Master of Science in Agricultural Engineering Technology is available to graduates in a recognized curriculum in agriculture or other related fields. Each applicant will be advised about any prerequisite courses before entering a program. The student's program of study must be approved by his/her advisory committee and must comply with the requirements of The Graduate School.

A completed departmental data sheet and three completed Graduate School Rating Forms are required in addition to The Graduate School application.

THE MASTER’S PROGRAMS

Agricultural Engineering Requirements
1. A total of at least 24 hours credit in graduate coursework in agricultural engineering and related areas. The minimum requirements are 12 hours in agricultural engineering; 9 hours in other engineering, mathematics, physical and biological science, agricultural, or business areas (as approved by the advisory committee); and 3 optional hours from either one of these two categories.
2. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering 610 (included in the 24 hours credit of #1) and must attend the graduate seminar each semester whether registered or not.
3. A Master's thesis comprising 6 hours of Agricultural Engineering 500.
4. A final oral examination covering the thesis, related areas, and graduate coursework.

Agricultural Engineering Technology Requirements
1. A total of at least 24 hours in graduate coursework in Agricultural Engineering Technology and related areas. Minimum requirements are 12 hours in agricultural engineering technology; 9 hours in other agricultural, business, physical and biological science, or engineering-related areas (as approved by the graduate committee) and 3 optional hours from either one of these categories.
2. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering Technology 552 (included in the 24 hours credit of #1) and must attend the graduate seminar each semester whether registered or not.
3. A Master's thesis comprising 6 hours of Agricultural Engineering Technology 500.
4. A final oral examination covering the thesis, related areas, and graduate coursework.
5. A minor in another subject area can be included in the program.

THE DOCTORAL PROGRAM

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

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

Agricultural Engineering

GRADUATE COURSES

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

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

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

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

459 Electrical Distribution and Utility Design (2)
Design of on-farm electrical systems, control, motors, stray voltage, special electrical loads, and safety. Prereq: Electrical Engineering 380. 1 hr and 1 lab. Sp,A

455 Waste Management System Design (2)
Waste renovation principles and livestock waste handling tech-
Agriculture

Agricultural Engineering Technology

GRADUATE COURSES

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

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

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: Physics 121 or consent of instructor. 2 hrs and 1 lab. Sp

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

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

510 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 and Mechanics 321, 341. 2 hr and 1 lab. FA

520 Agricultural Engineering Instrumentation (3) Modern instrumentation techniques. Static and dynamic response of instrumentation; signal conditioning; temperature, pressure, moisture, velocity, acceleration and flow measurements; digital data acquisition and control. Prereq: 410 or equivalent. 2 hrs and 1 lab. SpA

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

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

610 Seminar (1) Current research and literature. May be repeated. Maximum 3 hrs. E

620 Computer Simulation of Agricultural Systems (3) Scientific approach to digital simulation; system definition and boundaries, formulation of models, algorithms and solution techniques, encoding of prediction equations models, algorithms and solution techniques, encoding of prediction equations and model output; verification and calibration of simulation model results. Prereq: Basic Engineering 101, 201 or equivalent. 2 hrs and 1 lab. Sp


640 Research Problems in Agricultural Engineering (2) Research and manuscript preparation for a technical meeting presentation and submission to refereed journals. Course work will be significantly different from the thesis/dissertation and other reports. Student first author. E

650 Selected Topics in Agricultural Engineering (3) Lecture, group discussion, and individual study on specialized developments. May be repeated. Maximum 3 hrs. Sp

Animal Science

(College of Agricultural Sciences and Natural Resources)

GRADUATE COURSES

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., Ph.D. ................................... Rutgers
Bell, M. C. (Emeritus), Ph.D. ................. Oklahoma State
Bleiner, J. K. (Emeritus), Ph.D. ............... Ohio State
Chamberlain, C. C. (Emeritus), Ph.D. ...... Iowa State
Ericksen, B. H., Ph.D. ............................. Kansas State
Hall, O. G., Ph.D. ................................. Iowa State
Hansard, S. L. (Emeritus), Ph.D. ............ Florida
Lidvall, E. R. (Emeritus), M.S. .............. Tennessee
McDonald, T. P., Ph.D. .......................... Tennessee
McLaren, J. B. (Emeritus), Ph.D. ............ Auburn
Medeiros, D. M. (Emeritus), D.V.M. ....... Michigan State
Miller, J. K., Ph.D. ............................... Georgia
Murphee, R. L. (Emeritus), Ph.D. .......... Wisconsin
Richardson, D. O., Ph.D. ....................... Ohio State
Robbins, K. R., Ph.D. ............................. Illinois
Shirley, H. V. (Emeritus), Ph.D. ............. Illinois
Shrode, R. R., Ph.D. .............................. Iowa State
Tugwell, R. L. (Emeritus), Ph.D. .......... Kansas State

Agriculture

(College of Agricultural Sciences and Natural Resources)

GRADUATE COURSES

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.

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

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

THE MASTER'S PROGRAM

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

The program requires the writing of a thesis based on original research; the completion of a minimum of 24 hours of graduate coursework, of which at least 14 hours must be taken in courses numbered at or above the 500 level, and 6 hours of which must be included in the course requirement are 1 hour of Agriculture 512 and a minimum of 3 hours in statistics. These statistics courses must be chosen from the 400, 500, or 600 level of courses approved for use in the Intercollegiate Graduate Statistics 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 consists 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 plan 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, physiological, 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 Animal Science 581 and 9 hours at the 500 or 600 level in two non-management concentrations for a total of 12 hours (including 581).
3. A minimum of 1 hour of Agriculture 512 in addition to that required at the M.S. level.
4. A minimum of 6 hours in 400-, 500-, or 600-level statistics courses approved for the ICGSP.

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

GRADUATE COURSES

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

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

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

483 Poultry Production and Management (3) Structure of poultry enterprises: rearing, housing, feeding, processing, marketing, and marketing into complete poultry production and management program. Structure of industry, enterprise establishment, systems of production, production practices, and herd improvement program. Alternatives evaluated: production responses and economic returns. Prereq: Animal Science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. F

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

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

502 Registration for Use of Facilities (3-15) Required of all animal science graduate students. Presentations: beef and sheep, dairy, poultry, swine and veterinary science. May be repeated. 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 integration of principles of nutrition, physiology, and environmental effects on nutrient utilization; nutritive and non-nutritive additives. Prereq: Management, economics, computer science, statistics. 2 hrs and 1 lab. F

522 Principles in Physiological Recording (1) Theories of acquisition and interpretation of physiological data. Prereq: for animal science students. May be repeated. S/NC only. E

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

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

531 Analytical Techniques in Animal Sciences (3) Physical and chemical analyses of feeds, ingredients, tissues, and biological fluids associated with nutritive and non-nutritive additives. Prereq: Consent of instructor. 1 hr and 2 labs. F
Animal Science-Veterinary Medicine

See Veterinary Medicine for program description.

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used to meet degree requirements. May be repeated. Maximum 6 hrs. E

521 Advanced Mammalian Physiology I (4) Membrane, neuron, central nervous system, muscle, cardiovascular system, and control mechanisms. Prereq: general undergraduate anatomy and physiology and Biochemistry 410 or equivalent or consent of instructor. Recommended prereq: Biochemistry 419. (Same as Zoology 521.) 3 hrs and 1 lab.

522 Advanced Mammalian Physiology II (4) (Same as Zoology 522.)

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

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.

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

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

555 Anatomy of the Central Nervous System (4) Gross and microscopic anatomy of mammalian brain and spinal cord using sheep as model. Prereq: Consent of instructor.

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

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.

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

Anthropology

(College of Liberal Arts)

MAJOR DEGREES

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

William M. Bass, Head

Professors:

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

Associate Professors:

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

Assistant Professors:

Bass, Mary Ann, Ph.D. ............. Kansas State
Königsberg, L., Ph.D. .......... Northwestern
Wiley, P. S., Ph.D. .......... Tennessee

Research Associate Professor:

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

Research Assistant Professors:

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

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

THE MASTER'S PROGRAM

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

M.A. Requirements

1. A minimum of 30 hours for graduate credit. A minimum of 24 of these hours must be in anthropology, including the following:
   a. 510 and 550
   b. one of the following courses: 512, 513, 514, 515
   c. one of the following courses: 520, 531, 561, 564
   d. two of the following courses: 580, 581, 582, 583

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

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

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

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

THE DOCTORAL PROGRAM

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

1. Formation of an advisory committee and establishment of a program of study in consultation with the committee.

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

3. Students should plan to devote a minimum of 4 years beyond the B.A. to attain the Ph.D.

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

5. Demonstration of knowledge of one foreign language. This language should normally be French, German, Russian, or Spanish, but another language may be substituted at the committee's discretion. This requirement may be met by:
   a. Successful performance on a language examination administered by the appropriate language department. Students electing this alternative should consult with their advisor.
   b. Completion of the intermediate (200 level) sequence of a language with a grade of B or better in the second semester.
   c. Completion of the second semester of specialized reading courses for graduate students with a grade of B or better.

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

7. Successful completion of a dissertation and defense examination.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

410 Principles of Cultural Anthropology (3) Exploration and illustration of major concepts, theories, and methods in cultural anthropology, with application to analysis of select topics. Prereq: 120.

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

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

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

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

517 Forms of Social Inequality (3) Anthropological perspectives on societies stratified along lines of rank, caste, race, ethnicity, and class; inequalities engendered by sex role structure. Construction of social distinctions before and after rise and consolidation of modern world systems. Intersections of race and ethnicity with class and gender.

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

435 Historical Archaeology Laboratory (3) Laboratory procedures for processing, identification, and interpretation of artifacts from historical sites. Artificial material from historic East Tennessee sites used for class projects. Recommended prereq: 120 or consent of instructor.

440 Cultural Ecology (3) Concepts and methods in studying dynamic interaction between prehistoric and present day cultures and their environments; ecological theories and methods; review of selected studies. Prereq: 120, 130, 150, or consent of instructor.

450 Current Trends in Anthropology (3) Introduction to anthropological study of folklore, using folklore and folk-life materials from various tribal, peasant, and complex societies. Prereq: 130 or consent of instructor.

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

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

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

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

464 Principles of Zoarchaeology (3) Basic osteological studies of major vertebrate groups; aboriginal use of animals; cultural impacts on wildlife. 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 Archaeology (3) Field archaeology and interpretation of archaeological remains on historic urban sites in U.S. Lectures and field and laboratory research on urban sites in East Tennessee. Recommended prereq: Prehistoric Archaeology.

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

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

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

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


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

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

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

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

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

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: ethnological, psychological, anthropological, comparative social organization, religion, and art. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

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

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

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

516 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.

516 Nutritional Anthropology (3) Anthropological contributions to study of food-related cultural and biological variability in past and present populations. Prereq: 110, 120, 130, 150, or consent of instructor. Recommended prereq: Basic nutrition course.

520 Seminar in Zoarchaeology (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 Zoarchaeology (4) Examination and comparison of skeletons of major vertebrate groups, shells of terrestrial and aquatic molluscs, in relation to animal remains from archaeological contexts. Biological and cultural interpretation of faunal materials in prehistoric and historic sites. May be repeated. Maximum 8 hrs.

522 Seminar in Anthropology (3) Theoretical and practical approaches to anthropological research with class and gender.

523 Seminar in Archaeology (3) Theoretical and practical approaches to anthropological research with class and gender.

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

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

560 Theory in Anthropology (3) Detailed consideration of theory in contemporary anthropology: models of scientific explanation, research design, archaeological form and process, and methods of analysis and interpretation.

561 Archaeological Resource Management (3) Federal legislation and regulations affecting identification, protection, and management of cultural 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.

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

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

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 modern human populations. Functional morphology and phylogenetic relationships of Homo sapiens.

581 Forensic Anthropology (3) Application of physical anthropology to problems of forensic, historical, and archaeological interest. Determination of age, race, and sex of skeleton and preparation of reports for legal medicine. Prereq: 480.


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

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

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

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

587 Laboratory in Forensic Anthropology (3) Directed experience with selected anthropological techniques: radiographic analysis, dental examination, hair analysis, bone microstructure. Prereq: Human Origins, 480. 581 or consent of instructor. 1 hr and 1 lab.

588 Cultual and Ethnomedical Anthropology (3) Basic osteological studies of major vertebrate groups; aboriginal use of animals; cultural impacts on wildlife. Identification and interpretation of archaeologically derived molluscan and vertebrate remains. Introduction to laboratory use of comparative collections. Prereq: 120 or consent of instructor.
Architecture
(University of Tennessee)

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

Professors:
Anderson, G. L., M.Arch. Illinois
Conley, G. (Emeritus), B.Arch. Harvard
Grieger, F., M.Arch. Pennsylvania
Kelo, R. M., M.S. Tennessee
Kersavage, J. A., D.Sc. Southern Cal
Lauer, W. J., M.S.Arch.Eng. Iowa State
Lester, A. J., M.Arch. Virginia
Lizarran, R., Ph.D. Pennsylvania
Moffett, M. S., Ph.D. MIT
Robinson, M. A., M.Arch. Pennsylvania
Rudd, J. W., M.Arch. Northwestern
Shell, W. S., M.Arch. Columbia
Watson, J. S., M.Arch. Pennsylvania
Wodehouse, L. M., Ph.D. St. Andrews

Associate Professors:
Herz, M. D., B.Arch. Columbia
Martella, W. E., B.Arch. California
Naranjo, V., B.Arch. Belgrade
Rabin, J. S., M.A. Texas

Assistant Professors:
Coddington, J., M.Arch. Pennsylvania
French, R. C., B.Arch. Tennessee
Kaplan, M., M.Arch. Harvard
Livingston, M., M.F.A. Wisconsin
Reno, J. E., M.Arch. UCLA

Stucky, H., B.Arch. Kansas State
vonBeulow, P., B.Arch. Tennessee
Ware, S. M., B.Arch. Tennessee

The School of Architecture does not currently offer a graduate architecture degree; however, the courses listed below are available for graduate credit to students enrolled in other graduate programs.

Besides the undergraduate five-year Bachelor of Architecture degree program, the School of Architecture offers a three-year program leading to a Bachelor of Architecture to students who already hold a Bachelor's degree or an advanced degree in another field.

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

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

Second degree students are required to submit a portfolio which demonstrates a proficiency in freehand and orthographic drawing skills prior to taking Basic Architecture I. If an otherwise qualified student does not have these skills, he/she can come to the School of Architecture the summer before entering the second degree program and take an intensive drawing course which will fulfill the prerequisite.

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

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

403 Introduction to Preservation (3) History, theory, and legal aspects of architectural preservation and restoration.
404 Preservation Technology (3) Special seminars in history of materials and technology used in old buildings.
405 Descriptive Analysis of Historic Buildings (3) Identification and analysis of characteristic elements of buildings from various architectural periods, American architecture, survey techniques.
410 History and Theory of Urban Form (3) Patterns of community development. Selected historical and contemporary examples. Basic urban design issues and exemplary design approaches through lectures, readings, essays, and sketch studies. Historical change in urban form and design.
411 Architecture Since 1945 (3) Recent architectural developments and views of future.
412 Non-Western & Indigenous Architecture (3) Building responsive to climate, material availability, and economic level, as designed by anonymous builders. Prehistoric times to present throughout the world. Fertile Crescent; Indus Valley; Hindu, Buddhist, and Mughal architecture of India, China, and Japan.
413 Tennessee Architecture (3) History of settlement patterns and buildings 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 the present.
415 Medieval Architecture (3) History of architecture from the decline of Rome to the beginning of Renaissance.
416 Forms of Utopia (3) Ideas and architectural expressions of utopian movements, visionary and fantastic architecture. Concepts of future.
420 American Architecture, 1840-1940 (3) Stylistic periods from Gothic Revival through twentieth century.
421 History of Landscape Architecture (3) Technical, societal, and geographical influences that provide theoretical basis for design throughout history. Selected examples of landscape architecture analyzed in terms of design.
422 Modern East European Architecture (3) Twentieth-century architecture in Russia, Czechoslovakia, Poland, Hungary, East Germany, Romania, Bulgaria, Yugoslavia, and Poland.
425 Special Topics in History, Theory, and Criticism (1-4) Special topics in history-related subjects. May be repeated. Maximum 6 hrs.
442 Building Energy Analysis (3) Balancing heat flow through external skin of residential and small and large commercial buildings. Local climate analysis, site planning, building size and orientation, window area, wall treatment, infiltration control, and other design elements. Energy requirements and 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, ventilation, and air conditioning. Prereq: 341.
445 Advanced Lighting (3) In-depth analysis and innovative concepts in design of lighting. Prereq: 342.
473 Architectural Photography (3) Photography as design, research, and presentation medium. Application of photographic techniques, printing and processing. Color and black and white.
Art

(College of Liberal Arts)

**MAJOR**  
**DEGREE**  
Art  
M.F.A.

Don F. Kurka, Head  
William C. Kennedy, Associate Head

Professors:

- Blain, Sandra J., M.F.A.................Wisconsin
- Brokke, P. M., M.F.A.................Yale
- Clarke, R. A. (Emeritus), M.S........Wisconsin
- Cleaver, Dale G. (Emeritus), Ph.D........Chicago
- Faisetti, Joseph S., M.S........Ohio State
- Goldenstein, M. B., M.F.A........Nebraska
- Kennedy, William C., M.F.A........Wisconsin
- Kurka, Don F., Ph.D........New York
- Lee, B., M.F.A.............Yale
- Leland, W. E., M.F.A........Tennessee
- Livingston, P. R., M.F.A........Wisconsin
- Martinson, Fred. Ph.D........Chicago
- Nichols, P. G., M.F.A........Michigan
- Peacock, D. M.F.A........Iowa
- Resing, T. J., M.F.A........Nebraska
- Stewart, F. C., M.F.A........Claremont

Associate Professors:

- Daehnert, R. H., M.F.A.................Wisconsin
- Darrow, J. F., Ed.D........Illinois State
- Habel, Dorothy, Ph.D........Michigan
- LeFever, Richard, M.F.A........Rochester IT
- Lyons, B., M.F.A........Arizona State
- Moffatt, Ph. D........Chicago
- Neff, A., Ph.D........Pennsylvania
- Saupin, T., M.F.A........Wisconsin
- Wilson, D., M.F.A........California (San Diego)
- Yates, S., M.F.A........North Carolina (Greensboro)

Assistant Professor:

- Longobarbi, Pam. M.F.A........Montana State

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

**THE MASTER'S PROGRAM**

To become a candidate, the applicant must be admitted by The Graduate School and approved by the Department of Art. In addition to the admission requirements of The Graduate School, the Department of Art specifically requires the following:

1. A detailed letter of intent including statement requesting assistance, if desired.
2. Three letters of recommendation from former professors or professionals in the field.
3. An undergraduate major in art or evidence of equivalent proficiency.
4. An portfolio to be evaluated by the faculty.

Further information is available by writing to the Department of Art.

**M.F.A. Requirements**

- A minimum of 60 hours is required:
  1. Successful completion of 20 hours of studio courses in a concentration area. An inter-area program must be approved by the graduate faculty and must be included in the second year courses.
  4. A minimum of 9 hours of art history or related coursework offered by the University for graduate credit.
  5. A student with the permission of the art faculty is allowed to take 2 hours of academic classes as a substitute for 3 hours of art history.

- A three-hour seminar in art history or related coursework.
- A minimum of 20 hours must be completed at The Graduate School.

To become a candidate, the applicant must:

1. Successful completion of 20 hours of study.
2. A portfolio to be evaluated by the faculty.
3. An undergraduate major in art or evidence of equivalent proficiency.
4. A portfolio to be evaluated by the faculty.

A student must have completed all coursework prior to registration.

- A student with the permission of the art faculty is allowed to take 2 hours of academic classes as a substitute for 3 hours of art history.

- A minimum of 20 hours must be completed at The Graduate School.

- A portfolio to be evaluated by the faculty.

**ACADEMIC COMMON MARKET**

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

**GRADUATE MINOR IN THE HISTORY OF ART**

A graduate minor in Art History may be arranged with consent of the candidate, the instructors involved, and The Graduate School. Prerequisite is an undergraduate Art History minor, or consent of the art faculty, and a knowledge of French, German, or Italian, unless waived by the Art History faculty.

**GRADUATE COURSES**

401 Fiber: Advanced Projects (3-6) Prereq: 302 or consent of instructor. May be repeated. Maximum 12 hrs.

402 Fabric: Advanced Projects (3-6) Prereq: 301 or consent of instructor. May be repeated. Maximum 12 hrs.

405 Advanced Computer Enhanced Design (3) Prereq: 404 or consent of instructor. May be repeated. Maximum 6 hrs.

406 Goldsmithing (3-6) Metal smithing techniques: granulation, electroforming, electroplating, electropolishing, silvering, casting and smelting processes and studio problems, formulating, mixing and testing of clay bodies, glaze theory, glaze calculation, intensive formulating, mixing and testing of clay bodies and glaze formulas. Prereq: 404 or consent of instructor. May be repeated. Maximum 12 hrs.

411 Drawing IV (6) Individualized pursuit of personal drawing techniques and concepts, supplemented by individual and group critiques; weekly life drawing sessions. Prereq: 311. May be repeated. Maximum 12 hrs.

413 Painting IV (6) Individual concepts and personal expression with varied media. Prereq: 313. May be repeated. Maximum 12 hrs.


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


423 Ceramics: Surface Design (3) High and low fire glaze techniques. Use of clays, slips, underglazes, airbrush, and lustres. Relationship between form and surface. Individual direction. Prereq: 421 and 322.

424 Ceramics: Clay and Glazes (3) Clay chemistry, clay bodies, glaze theory, glaze calculation, intensive formulating, mixing and testing of clay bodies and glaze formulas. Prereq: 421 and 322.

425 History of Ceramics Seminar (3) Ceramics from ancient through contemporary. Ceramics sculpting, vessel and sculpture, Slides and individual presentations. May not be used toward art history requirement. Prereq: 421 and 322.

426 Kilns: Design, Construction and Operation (3) Designing kilns, traditional and modern refractories, construction methods, and operation of wood, gas, and electric kilns. Prereq: 421 and 322.

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


439 Special Topics in Photography (3) Student- or instructor-initiated course offered at convenience of de-
Art and Music Education

(College of Education)

MAJORS	DEGREES
Art Education.........................................M.S.
Music Education.......................................M.S.

Charles H. Ball, Head

Professors:

Ball, Charles H., Ph.D...............................Peabody
Hull, H. N., Ed.S.....................................Peabody
Humphreys, A. W. (Emeritus), Ed.D........Illinois
Jones, J. H. (Emeritus), Ed.D..............Columbia
Julian, W. J, Ph.D..........................Northwestern
Moore, M. C., Ph.D............................Michigan
Robertson, J. W. (Emeritus), Ed.D.........Columbia
Tipples, A. W., Ph.D............................Michigan

Associate Professors:

Gill, H. L. (Emeritus), B.S..............................Milwaukee State Teachers
McDaniel, Walter H. (Emeritus), M.S........Tennessee
Mintz, J. O. Ed.D.................................Columbia
Sparks, J. R., M.S.................................Tennessee
Watkins, J. Paul, M.S............................Tennessee

Assistant Professor:

Root, Patricia, M.A.................................Washington State

The Department of Art and Music Education offers graduate programs leading to the Master of Science with a major in Art Education or in Music Education. Although degree requirements are sufficiently flexible to allow programs to be tailored to the specific needs of the individual, all emphasize a balance between creative work in the arts discipline, advanced teaching techniques, and a study of the philosophical and historical foundations of the field.

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

Art Education

The department offers two tracks for the Master of Science degree in Art Education. Track 1 is for students who are already certified to teach in the discipline or those who are seeking the M.S. degree without certification. Track 2 is designed for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

Track 1 - The thesis option requirements are: Art Education 510, 520, and 593; 6 hours of 500-level elective courses in art history; 6 hours of 400 or 500-level elective courses in studio art; Curriculum and Instruction 580; 6 hours of 500-level elective courses in education; and 6 hours of Art Education 500 for a total of 36 semester hours. The non-thesis option requires the completion of 36 hours of coursework in art education (including practical experience), curriculum and instructional practice, and an additional 6 hours of 590 Special Topics culminating in an exhibition. The exhibition of original art produced under the direction of Art and Art Education faculty and accompanied by a written analytical and critical essay. This essay must include a philosophical statement, an explanation of process and media for each work presented, and a compositional analysis of each work.

Track 2 - The non-thesis option requirements are: Art Education 510, 520, 530, 540, and 553; Education 574, 575, 591, and 3 additional hours of Education electives at the 500 level for a total of 36 hours. The thesis option requires 6 additional hours of Thesis 500 for a total of 42 hours.

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

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
510 History and Philosophy of Art Education (3) United States from 1860 to present. Prereq: Consent of instructor.
520 Studies in Art Education (3) Current practices and procedures in art education; unit planning, sequence organization and teaching methods. Prereq: Consent of instructor.
530 Developing Art Curriculum and Teaching Strategies (3) Curriculum development and teaching strategies; K-12, demonstrations of instructional methods using micro and simulated teaching situations, analysis of programs, classroom management skills and student evaluation procedures.
540 Instructional Materials and Production Related to the Teaching of Art (3) Development and use of instructional aids concerned with all aspects of teaching art: videotapes, audiotapes, slides, charts, and learning packs.
590 Special Topics in Art Education (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
593 Independent Study in Art Education (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Music Education

The Master of Science requires Music Education 510 and 520; 9 hours of music education electives at the 500 level; 6 hours of Thesis 500; 6 hours of 500-level courses in music theory or history; 2 hours of applied music at either the 400 or 500 level; 3 hours of music theory or music history at the 500 level; and 6 hours of music or music education electives at the 500 level.

A three credit research problem and three extra hours coursework in Music Education may be substituted for Thesis. If a larger thesis problem is desired, the thesis credit may be increased to 9 credit hours and 3 credit hours of Music Education electives may be dropped.

For students participating in the professional internship program and seeking initial certification, the Master's degree may be awarded upon the successful completion of the 24 hours earned in the internship year and an additional 12 hours consisting of six additional hours in graduate-level Music courses and Music Education 510 and 520. For the thesis option, 6 additional hours of Thesis 500 are required for a total of 42 hours.

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

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
510 Foundations of Music Education (3) Historical, philosophical and aesthetic bases. Prereq: Consent of instructor.
520 Research in Music Education (3) Definition of research problems, data collection and analysis, and research report writing. Application of knowledge of research techniques to analysis of existing research literature in music education. Prereq: Consent of instructor.
530 Advanced Band Literature and Conducting (3) Reading, conducting, and interpreting band scores suitable for school, college, and community bands; contemporary and standard band literature. Prereq: Consent of instructor.
540 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores suitable for school, college, church, and community groups. Prereq: Consent of instructor.
550 Curriculum Development and Evaluation in Music Education (3) Principles of curriculum development applied to music education programs. Formulating objectives; construction of evaluation instruments; survey of appropriate literature. Prereq: Consent of instructor.
555 Administration and Supervision of School Music (3) Problems of supervision, research, and in-service education, teacher preparation, guidance. Prereq: Consent of instructor.
560 Psychology of Music Teaching (3) Research on musical perception and cognition and its application to teaching of music. Definition and measurement of musical ability. Prereq: Consent of instructor in general psychology and 1 yr of music theory or consent of instructor.
570 Studies in Elementary and Middle School Music (3) Current trends and research in teaching of music in elementary and middle school. Prereq: Consent of instructor.
580 Seminar in Music Education (3) Class investigation and individual reporting of pertinent topics and issues in music education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
590 Special Topics in Music Education (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
593 Special Problems in Music Education (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Astronomy

See Physics and Astronomy

Audiology and Speech Pathology

(College of Liberal Arts)

MAJORS	DEGREES
Audiology..............................................M.A.
Speech and Hearing Science.......................Ph.D.
Speech Pathology.....................................M.A.
research oriented, with primary emphasis upon developing the scientific and cognitive skills which allow individuals to identify and independently study important questions concerning the nature and treatment of communication disorders.

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

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

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

The total program is a minimum of 60 semester hours, including a minimum of:

- 24 semester hours in dissertation 600.
- 6 semester hours in a research tool.
- 6 semester hours in a cognate area outside the department.

- 24 semester hours in 600-level coursework within the department of which:
  a. a minimum of 6 semester hours in the topic of major interest;
  b. a minimum of 6 semester hours in topic(s) of related interest;
  c. 2 semester hours in 611; and
  d. 3 semester hours in supervised teaching experience.

5. A comprehensive examination to demonstrate scholarly knowledge of audiology, speech, and language pathology, and speech and hearing science; and advanced knowledge of the specifics of the area of concentration.

A final oral examination.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

404 Appraisal of Speech and Language Disorders

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

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

433 Clinical Practice in Speech-Language Pathology (1-14) Prereq: 320, 331 or consent of instructor. Enrollment for fewer than 2 hrs must have prior departmental approval. (Same as Special Education 433.)

434 Clinical Practice in Speech-Language Pathology (1-14) Prereq: 433 and consent of instructor. Enrollment for fewer than 2 hrs must have prior departmental approval. (Same as Special Education 434.)

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

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

461 Introduction to Language Pathology in Children (3) Nature, etiology and treatment of language retardation in children. Prereq: consent of instructor. 304 or consent of instructor.

463 Practical Applications of Language Habilitation Techniques (3) Various methods and procedures in training delayed-disabled preschoolers. Alternative augmentative systems. Prereq: 400 or consent of instructor.

485 Speech and Language of the Differentially Able Child (3) Speech and language differences of children of various minority groups, of different ethnic and social origins from that of students in the United States.

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

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

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

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

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


511 Introduction to Research in Speech and Hearing (3) Analysis of research techniques, fundamentals of statistics, application of statistics, and completion of a proposal and hypothetical pilot research project. Prereq: 461.

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

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

514 Practicum in Verbo-Tonal Habilitation (1-4) Prereq: 494, 595, or consent of instructor. May be repeated. Maximum 6 hrs.

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

517 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation in audiology and speech pathology, laboratory assignments for familiarization of students with instruments for measuring speech and hearing.

520 Aphasia (3) Historical review of aphasia literature, theories of brain functioning, aphasic classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 506 or equivalent or consent of instructor.

522 Seminar: Articulation and Voice Disorders (3) Current research in diagnosis and management of articulatory and voice disorders. Prereq: 320. Enrollment in graduate courses in articulation and voice disorders or consent of instructor.

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

532-33-34 Advanced Clinical Practice in Speech-Language Pathology (9-15) Prereq: 434 or equivalent and consent of instructor. 554 may be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

535-36-37 Advanced Clinical Practice in Speech-Language Pathology: Off-Campus Sites (1-4, 1-4, 1-4) Prereq: 100 hrs clinical experience, consent of instructor. May be repeated. Enrollment for less than 2 hrs must have prior departmental approval.
538 Advanced Clinical Practice in Speech-Language Pathology; Public Schools (1-4) May be repeated. Maximum 6 hrs. Consent of instructor or less than 2 hrs must have prior departmental approval.

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


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

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

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

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

551 Advanced Auditory Assessment (3) Theoretical and applied considerations of procedures used to identify lesions in auditory mechanism: behavioral assessment, acousticimmittance and electrophysiological techniques. Prereq: 473, 507 and 548.

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.

557 Management and Supervision for Speech-Language-Hearing Professionals (3) Management systems, accountability, personnel appraisal and clinical supervision for audiologists and speech language pathologists interested in private practice, supervisory or administrative positions.

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

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

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

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

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

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

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


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

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

602 Psychoacoustics (2) Auditory perception and comprehension of nonspeech and speech stimuli. Prereq: 517.

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


608 Advanced Clinical Concepts and Models in Hearing Science (3) Bioacoustics and psychological concepts of clinical manifestations in pathological condition of ear. Electrical, mechanical, and mathematic models of normal and abnormal auditory mechanism function. Prereq: Consent of instructor.

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

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

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

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

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

625 Advanced Auditory Assessment (2) Topics vary: aberrations of voice, articulation, speaking super sensitivity, language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

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

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

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

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

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

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

### Aviation Systems (UT Space Institute)

#### MAJOR

**DEGREE**

<table>
<thead>
<tr>
<th>Aviation Systems</th>
<th>M.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. D. Kimberlin, Program Chair</td>
<td></td>
</tr>
</tbody>
</table>

**Professors:**

- Collins, F. G., Ph.D.  California
- Mason, A. A., Ph.D.  Tennessee
- Roberds, R. M., Ph.D.  AFT
- Wu, J. M., Ph.D.  Cal Tech
- Young, R. L. (Emeritus), Ph.D.  Northwestern

**Associate Professors:**

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

**Assistant Professor:**

- Solis, U. P., Ph.D.  Tennessee

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

To qualify for admission to this program, the applicant must possess a Bachelor's degree in engineering or science from an accredited institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee Graduate School admission procedures and grade-point standards. It is expected that the student will have a basic knowledge of computer utilization and statistics; an understanding of aerodynamic fundamentals, aircraft propulsion, and performance; and some understanding of economics. Both thesis and non-thesis programs are available. The thesis program involves a minimum of 30 semester hours credit while the non-thesis program involves a minimum of 33 semester hours credit.

**THESIS OPTION**

The thesis program involves satisfactory completion of the following requirements:

**Research and Development Specialization**

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

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

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

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

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

### GRADUATE COURSES

#### 500 Thesis (1-15) 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 and developments pertinent to present status and future development of air transportation.

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

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

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

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

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

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


### Biochemistry

#### College of Liberal Arts

<table>
<thead>
<tr>
<th>Major</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>M.S., Ph.D.</td>
</tr>
<tr>
<td>Wesley D. Wicks, Head</td>
<td></td>
</tr>
</tbody>
</table>

#### Professors:
- Churchich, Jorge E., Ph.D.   
- Wang, Leaf, Ph.D.            
- Joshi, J. G., Ph.D.          
- Monty, Kenneth J., Ph.D.    
- Salo, T. P. (Emeritus), Ph.D. 
- Wicks, Wesley D., Ph.D.      
- Wyckoff, J. W., Ph.D.

#### Associate Professor:
- Ketosis, John W., Ph.D.

#### Assistant Professors:
- Feinberg, R. H. (Emeritus), Ph.D.
- Howell, Elizabeth E., Ph.D.
- Roberts, Daniel M., Ph.D.
- Serpurs, Engin H., Ph.D.

#### Adjunct Faculty:
- Farkas, W., Ph.D.
- Georgiou, S., Ph.D.
- Kennel, S., Ph.D.

### The Master's Program

**1. At least one year each of Introductory Organic Chemistry with laboratory** and approved physical chemistry.

**2. A minimum of 8 semester hours of approved biology courses beyond the introductory level and including the subject areas of genetics and physiology.**

**3. Biochemistry 511-12 and 515-16.**

**4. At least 6 hours of advanced seminar courses from the following: 601, 603, 604, 605, 606.**

**5. Six hours of Master's research and a thesis.**

**6. A final examination that covers both the thesis endeavor and the subject matter of the course requirements.**

### THE DOCTORAL PROGRAM

**1. Introductory Organic Chemistry\,*\ Introductory Physics\,*\ Differential and Integral Calculus\,*\ approved physical chemistry, and at least 12 hours of biology beyond the introductory level and including the subject areas of genetics and physiology.**

**2. Biochemistry 511-12 and 515-16.**

**3. At least 3 hours of approved graduate courses in chemistry, physics, or other physical science; for example, Chemistry 550, 551, 552, Physics 521, 522, 551. No survey courses will be accepted.**

**4. At least 6 hours of topics offered in 521 and 621.**

**5. Participation in 601 and 603 during the entire period of residence.**

**6. Comprehensive examination, taken before the end of the third year of study.**

**7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.**

**8. Final oral examination which will be concerned primarily with the student’s dissertation.**

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

#### Petitioning for Master's Degree

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

1. The preparation of a research manuscript suitable for submission for publication in a major scientific journal and oral defense of that manuscript before an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department; or

2. Publication of at least one full-length paper in a major biochemical journal as senior author.

### GRADUATE COURSES

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

419 Cellular and Comparative Biochemistry Lab (2) Experiments with enzymes, nucleic acids, and mem-

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.

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

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

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

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

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

516 Experimental Techniques II (3) Laboratory rotations. Student works in laboratory of faculty member on clearly defined research projects; rotation of projects. Primarily for departmental graduate students. Prereq 515, Sp.

521 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated. Maximum 12 hrs. E.

561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; reproductive toxicology; mutagenesis, teratogenesis, carcinogenicity, pathologic changes and environmental impact. Prereq: 410. Chemistry 350-60-65 or consent of instructor. (Same as Ecology 561), F.

562 Techniques in Environmental Toxicology (1) Experimental techniques for assessment of presence, toxicity and impacts of pollutants in global ecosystem: Laboratory exercises on analytical, biochemical, and bioassay methods in toxicological studies. Prereq: 419 or (quantitative analysis), 561 and Chemistry 350-60-65. (Same as Ecology 562), Sp.

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


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

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


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

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

### Biomedical Sciences

(Office of the Vice Chancellor for Academic Affairs)

#### MAJOR

<table>
<thead>
<tr>
<th>DEGREES</th>
</tr>
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<tbody>
<tr>
<td>Biomedical Sciences</td>
</tr>
<tr>
<td>Raymond A. Popp, Director</td>
</tr>
<tr>
<td>Professor</td>
</tr>
<tr>
<td>Orlins, Donald E., Ph.D.</td>
</tr>
<tr>
<td>Research Professor</td>
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<tr>
<td>Orlins, Ada L., Ph.D.</td>
</tr>
<tr>
<td>Research Associate Professor</td>
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<tr>
<td>Chang, Lan-Yang, Ph.D.</td>
</tr>
<tr>
<td>Research Assistant Professor</td>
</tr>
<tr>
<td>Foote, Robert S., Ph.D.</td>
</tr>
<tr>
<td>Uberbacher, Edward C., Ph.D.</td>
</tr>
</tbody>
</table>

Shared Faculty:

- Not all faculty listed are necessarily available in teaching and/or research roles in every academic year.
- Bunick, Gerald J., Ph.D. Pennsylvania
- Cook, John S., Ph.D. Princeton
- Fry, R. J. M., M.D. Dublin
- Fujimura, Robert K., Ph.D. Wisconsin
- Gehrs, C. W., Ph.D. Oklahoma
- Hartman, Fred C., Ph.D. Tennessee
- Jacobson, K. Bruce, Ph.D. Johns Hopkins
- Kennel, Steve, Ph.D. California
- Kenney, Francis T., Ph.D. Johns Hopkins
- Laimer, Frank W., Ph.D. Florida
- Lee, Kai-Lin, Ph.D. Tulane
- Littlefield, Gayle, Ph.D. Georgia
- Marchok, Ann C., Ph.D. Connecticut
- Mazur, Peter, Ph.D. Harvard
- Mila, Sankar, Ph.D. Wisconsin
- Murali, Richard, Ph.D. Georgia
- Niyogi, Soli K., Ph.D. Northwestern
- Popp, Raymond A., Ph.D. Michigan
- Preston, R. Julian, Ph.D. California
- Reading, James D., Ph.D. Hawaii
- Richardson, C. R., Ph.D. New Mexico
- Rinchik, Eugene M., Ph.D. Duke
- Russell, Liane B., Ph.D. Chicago
- Sega, G. A., Ph.D. Louisiana
- Shugart, Lee H., Ph.D. Tennessee
- Snyder, Fred L., Ph.D. North Dakota

#### ADMISSION REQUIREMENTS

A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Recit Examina-
tions scores and letters of reference should be sent to the address below. The student will need preparation in biology, calculus, physics, and organic and physical chemistry. A course in physical chemistry is offered by the school in order to meet the last requirement. It is recommended that deficiencies in preparation, as identified in the admission process, be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box 2009, Oak Ridge, Tennessee 37831-8077.

#### THE DOCTORAL PROGRAM

1. Satisfactory (B grade or better) completion of the following core courses or their equivalent: Biochemistry (511); Biophysical Biochemistry (514); Genetics (515); Molecular Genetics (517); Cell Biology (519); Computing for the Biological Sciences (525); and Statistics for Biologists (574).

The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Biology Division of Oak Ridge National Laboratory, offers programs leading to the Master of Science and the Doctor of Philosophy. The National Laboratory is a well-known center of basic research. The school utilizes the staff and facilities of this laboratory, and thus brings directly into the mainstream of full-time graduate study in all the science the student and experience of that staff, as well as the most advanced research methods and technology.

The program of study, which incorporates a high faculty-to-student ratio, is based on intensive graduate courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a heavy emphasis on communication skills, research training, and independent study. The program encourages students to pursue graduate studies to the limits of their ability.

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

The concentration areas available for Master's thesis and Ph.D. dissertation work are biochemistry, biophysics, carcinogenesis, genetics, cellular, developmental and mammalian biology, and radiation biology. Included are such subjects as immunology, protein and enzyme chemistry, nucleic acid chemistry, cytology, radiation and environmental biology, virology, developmental biology, experimental pathology, microbial and mammalian genetics, mutagenesis, and problems of aging.

-- Solomon, A. M., M.D. -- Duke
-- Stevens, Audrey L., Ph.D. -- Western Reserve
-- Terzaghi-Howe, Peggy, D.Sc. -- Harvard
-- Vo-Dinh, Tuan, Ph.D. -- Swiss Fed IT
-- Winters, Larry C., Ph.D. -- California
-- Woychik, Richard P., Ph.D. -- Case Western
-- Yang, Wen K., M.D., Ph.D. -- Tulane

-- Mazur, Peter, Ph.D. -- Harvard
-- Lee, Kai-Lin, Ph.D. -- Tulane
-- Rinchik, Eugene M., Ph.D. -- Duke
-- Littlefield, Gayle, Ph.D. -- Georgia
-- Marchok, Ann C., Ph.D. -- Connecticut
-- Mazur, Peter, Ph.D. -- Harvard
-- Mila, Sankar, Ph.D. -- Wisconsin
-- Murali, Richard, Ph.D. -- Georgia
-- Niyogi, Soli K., Ph.D. -- Northwestern
-- Popp, Raymond A., Ph.D. -- Michigan
-- Preston, R. Julian, Ph.D. -- California
-- Reading, James D., Ph.D. -- Hawaii
-- Richardson, C. R., Ph.D. -- New Mexico
-- Rinchik, Eugene M., Ph.D. -- Duke
-- Russell, Liane B., Ph.D. -- Chicago
-- Sega, G. A., Ph.D. -- Louisiana
-- Shugart, Lee H., Ph.D. -- Tennessee
-- Snyder, Fred L., Ph.D. -- North Dakota
SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

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

1. Graduate credit or a proficiency in the following core courses: Biochemistry (511); Biophysical Biochemistry (514); Cell Biology (516-19); plus any three of the following courses:
   - Genetics (515)
   - Molecular Genetics (517)
   - Statistics for Biologists (574)
   - Computing for the Life Sciences (525)
   Additional credits may be obtained (6 to 15 hours) with electives.
2. Thirty hours of approved graduate courses including 6 hours for thesis.
3. For admission to candidacy: Completion of any required prerequisite courses and one semester of graduate coursework with a B average. Admission to candidacy forms must be filed at least one full semester prior to receipt of degree.
4. A Master's committee of three approved faculty members upon admission to candidacy.
5. A thesis reporting results of original and significant scientific research.
6. Passing a final oral examination.

GRADUATE COURSES

500 Thesis (1-19) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or for the student not otherwise registered during any semester when student uses University facilities and/or for the student not otherwise registered during any semester when student uses University facilities and/or for the student not otherwise registered during any semester when student uses University facilities and/or for the student not otherwise registered during any semester when student uses University facilities.
507 Physical Chemistry (3) Thermo-dynamics; phase equilibria; chemical equilibria; electrochemistry; surface forces; surface chemistry; electrolyte solutions; kinetics; conductance; viscosity; diffusion.
511 Biochemistry (3) Chemistry of carbohydrates, lipids, proteins, and coenzymes; enzyme kinetics intermediates; metabolic pathways; and photosynthesis; biosynthesis of amino acids; lipid and macromolecules.
514 Biophysical Biochemistry (3) Chemistry of macromolecules and membranes; structure and function of proteins and nucleic acids; biosynthesis of RNA, DNA, and proteins. Energy levels and excited states of large molecules; optical instrumentation and applications to system perturbations; functional macromolecules in solutions; molecular structure; molecular conformations; inter- and intramolecular forces; principles of microscopy.
515 Genetics (3) Mendelian genetics, mitosis and meiosis; transmission genetics; mapping and linkage; genetics of phage, bacteria and eucaryotes; mapping or recombinants; chromosomal aberrations; mechanisms of recombination, chromosome structure and replication.
517 Molecular Genetics (2) Molecular biology of genetic processes. Three distinguished outsiders in lectures present current research on mechanisms of gene regulation; protein synthesis; suppression of nonsense mutation; mutagenesis; gene defects and hereditary diseases. Prereq: 511, 514, and 515.
518 Cell Biology I (3) Structure and composition of major nuclei and cytoplasmic organelles of eukaryotic cells. CELLulose and microtubules; cell cycle; chromosome structure; nuclear RNA metabolism; nucleoli and ribosome biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 511.
519 Cell Biology II (3) Comparative biochemical approach to cell structure and function. Membrane systems and metabolism; development and function of microorganisms; plasmolemma, peroxisomes and other organelles as related to metabolism and regulation; transport phenomena; cell cycle; cell products; interaction of cells; function of tissues and organs. Prereq: 511, 518.
525 Computing for the Life Sciences (3) Interactive computing; Mini- and micro-computing environments; Basic, Fortran, and/or Pascal languages; application of statistics; graphics, text manipulation, and computer communications.
531-32-33 Biomedical Sciences Laboratory (3,3,3) Approaches and technologies in various areas of modern biology. Students spend a semester in each of three laboratories conducting research in different areas of biomedical science. Required of all first-year students.
543-46-49 Graduate Research Participation (3,6,9) Special advanced research project not related to dissertation research. Topics chosen with consent of instructor. May be repeated. 551-52-53 Special Topics in Biomedical Sciences (3,3,3) Either tutorials or formal lectures. Potential topics: X-ray diffraction and crystallography; excited-state biophysics; physical chemistry or macromolecules; pathology; mammalian genetics coverage.
574 Statistics for Biologists (2) Application and interpretation of statistical methods in data analysis. Random variation; normal, binomial and Poisson distribution; statistical presentation of data, estimating means and variance; confidence intervals; tests of significance for comparing samples; analysis of variance; contingency tables; Chi squared test; correlation; simple linear regression. Prereq: Statistics 201 or consent of instructor.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
622 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by-product, substrate and dead end inhibitors; simulation and inhibition of allosteric enzymes, types of feedback regulation; role of sub-units in enzyme regulation; multifunctional enzymes. Prereq: 511, 514.
624 Chemistry and Metabolism of Lipids (2) Nomenclature, chromatographic isolation; chemistry, physical properties, and enzymology and lipids. Hormonal action of prostaglandins and role of lipid in membranes, enzymatic expression, and nervous tissue. Lipid biochemistry of mammals. Comparative aspects, lipid pathways in bacteria, 125 years of lipid research. Prereq: 511.
628 Molecular Genetics of Carcinogenesis (2) DNA and RNA tumor viruses, oncogenes, growth factors, and their potential role in induction of cancers.
651 Techniques in Cell Biology (3) Basic concepts of cell biology techniques, their application to specific research problems, kind of data yield, and cautions in data interpretation. Laboratory demonstrations may be arranged where appropriate. Prereq: 511, 514, 518, 519.
551-52-53 Advanced Topics in Biomedical Sciences (3,3,3) Current and future research developments: protein synthesis, protein chemistry and enzyme mechanisms; cytology, and special topics. Either as tutorial or literature survey requiring substantial student preparation. May be repeated.
660 Mammalian Genetics (3) Known genetic variants affecting each organ system of experimental mammals, especially laboratory mice, inheritance of phenotypical and biochemical traits in rodents and other laboratory rodents. Prereq: 515.
665 Microbial Genetics (3) Basic phenomena in microbial genetics; transduction, transformation, conjugation, and mutation. Genetics of bacteriophage. Prereq: 515, 517.

Botany

(Chinese)
Lecturer:

McFarland, K., Ph.D., University of Tennessee

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, botany, mycology, physiology, and taxonomy.

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

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

ADMISSION REQUIREMENTS

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

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

2. General botany or general biology: 24 semester hours.

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

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

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

Evidence of a broad undergraduate background, an ability to do work of graduate quality, and an interest in the study of plant science are considered to be much more important than the particular courses taken as an undergraduate. Accordingly, students lacking specific prerequisites or 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 comprehensive course of study than the Ph.D. program. However, the applicant must be equally well prepared and display an aptitude for doing graduate work. The student should be well prepared and display an aptitude for doing graduate work. The student should be well prepared and display an aptitude for doing graduate work.

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 courses for the completion of the degree. Most students spend from three to five years working on their Ph.D.

Requirements for successful completion of the Ph.D. degree include:

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 500.

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 302.

5. Satisfactory completion of 6 hours at the 500 level (excluding dissertation).


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

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

GRADUATE COURSES

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


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

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

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

451 Plant Tissue Culture (3) Methods for culture of cells, tissues, and organs: media preparation and maintenance of cultures. Prereqs: 120-121 or Botany 120-121 or equivalent and Chemistry 120-30 or equivalent. Recommended prereqs: 310-20, 321, 412; Microbiology 310 or 319; Environmental Horticulture 330; and Plant and Soil Science 331.

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

501 Mycology (4) Intensive survey of fungi, all major classes, lecture laboratory and field information. Occasional field trips. Prereq: 310. 3 hrs and 1 lab. 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 Non-Thesis Research (2) Library, field, or labora-
yory 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, both freshwater and marine: morphological, developmental, ecological, taxonomic and phylogenetic aspects. Field and laboratory studies, identification, classification, experimentation. Prereq: 310 or consent of instructor. 3 hrs and 1 lab. F,A

507 Biological Illustration (3) Principles and application of photography, black and white and color photography, drawing, graphics and video for recording and presentation for research and publication of data relating to biology and medicine. Prereq: 110-20.

509 Morphology and Evolution of Basidiomycetes (3,4) Structure and function of somatic and sexual life cycles as applied to evolution in group. Cultures and specimens in laboratory. Prereq: 310 or equivalent.

512 Taxonomy of Grasses and Grass-like Plants (3) Collection, identification, classification of grasses, sedges and rushes, phylogeny of the grass subfamilies and tribes. Prereq: 330 or consent of instructor. F

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

521-22 Advanced Plant Physiology I, II (3,3) Metabolism, plant physiology, biochemical and molecular processes, cellular energy metabolism, photosynthesis, carbon partitioning, and biochemistry of specialized plant products: terpenoids, alkaloids, phenolics and plant growth regulators. Growth and differentiation of plants at molecular, cellular and organismic levels. Hormonal regulation of development: macromolecular interpretation of differentiation, dormancy, gemini-

523 Advanced Plant Physiology III (3) Growth and differentiation of plants. Prereq: Introduction to Biochemistry or Biochemistry 410 and 1 semester of introductory plant physiology. Prereq: 310 or equivalent.

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

(Office of Communications)

MAJOR

Communications

M.S., Ph.D.

Norman R. Swan, Head

Professors:

Holt, Darrel W. (Emeritus), Ph.D. Northwestern

Howard, Herbert H., Ph.D. Ohio

Swan, Norman R., Ph.D. Southern Illinois

Associate Professors:

Moore, B. A., Ph.D. Indiana

Ziegler, Dhyana, Ph.D. Southern Illinois

Adjunct Professor:

Nelson, Lindsey, B. A. Tennessee

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

GRADUATE COURSES

410 Television News (3) Writing, reporting, performing, and producing news for television. Experience as reporter/producers for television news program. Prereq: 310. 1 hr and 4 labs. F

420 Radio-TV Sales and Promotion (3) Problems and techniques used by stations and consultants in broadcast selling. Prereq: Consent of instructor. Sp

430 Producing for Television (3) Principles of television studio and field production, both technical and creative. Writing, producing, shooting, and editing video stories and programs, 3/4" cameras, recorders, and editing system. Prereq: 320. E


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: 590. Sp

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

Business Administration

(Office of Business Administration)

MAJOR

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

The College of Business Administration offers two college-wide programs, the MBA and the Ph.D. with a major in Business Administration. A dual degree program is available with the College of Business and the J.D.-MBA. To obtain application materials, write or call: Associate Dean for Academic Affairs, Suite 527, Stokely Management Center, College of Business Administration, The University of Tennessee, Knoxville, TN 37996-0550, Telephone: (615) 974-5033.

ACADEMIC COMMON MARKET

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

ACADEMIC STANDARDS

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

THE MBA PROGRAM

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

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

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

Admission Requirements

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

To be considered for admission, the applicant's file must be complete. A completed file includes the Graduate School Application, transcripts of prior college work, the MBA program application, two completed applicant recommendation forms, and the Graduate Management Admission Test (GMAT) score report. The first items should reach The Graduate School 30 days before the MBA application deadline to allow for processing. Additional information is required by The Graduate School for international students.

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

Prerequisites

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

MBA Core

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

First semester: Business Administration 501, Accounting 501, Management 504, Economics 501
Third semester: Economics 503, Business Administration 506.

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

Concentration and Electives

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

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

Controllership

Economics
Financial Management
Forest Industries Management
Management
Marketing
New Venture Analysis and Entrepreneurship
Statistics
Logistics and Transportation

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

Transfer Credits

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

MBA Core: 6 hours

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

Elective Area: 3 hours.

The maximum number of hours that may be transferred is 8 semester hours. Transfer credit will be considered upon formal petition to the Associate Dean for Graduate Business Programs.

Other Requirements

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

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

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements see above.

MBA Concentration: New Venture Analysis and Entrepreneurship

The concentration is comprised of three specifically designed courses which are interdisciplinary in nature. This concentration strives to build a strong academic foundation for both entrepreneurial and intrapreneurial activities. The new venture analysis and entrepreneurship concentration is offered to both full-time and part-time students in recognition of the growing trend in American business today towards new product/venture development. The new venture analysis/entrepreneurship concentration courses may be combined with two elective courses in another area (management or marketing) to achieve a dual concentration.

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

PRE-MBA PROGRAM

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

Admission requirements are higher than those normally expected of MBA applicants. Desired qualifications include a minimum 3.4 GPA and a GMAT score of 600 or higher.

Students interested in the program are counseled initially in the Liberal Arts Advising
DUAL J.D.-MBA PROGRAM

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

The establishment of the dual program recognizes the increasingly complex body of knowledge necessary to the creative conduct of business and business-related law practice, the complementary nature of many aspects of the graduate programs of the College of Law and the College of Business Administration, and the intellectual benefits inherent in the concurrent study of both business and business-related law. Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, their senior year under the senior privilege rule, which requires them to notify The Graduate School in advance of the course for graduate credit. Upon successful completion of the fifth year, the student receives the MBA degree.

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. The dual program will include as such courses quality 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 12 semester hours of credit toward the MBA for acceptable performance in approved graduate courses offered in the College of Law, 3 hours of which will replace Business Law 501, an MBA core requirement. 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 the J.D. coursework while completing the first year of the business curriculum. During the first year in the J.D. program, students register through the College of Law. For any term in which students take MBA courses, even though they are also taking law courses, they must register through The Graduate School. The Graduate School registration form must be approved by the Associate Dean for Academic Affairs.

Awarding of Grades

Grades for graduate business courses accepted by the College of Law and grades for law courses accepted by the College of Business Administration may be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college in which such grades are so converted. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. The College of Business Administration will award a grade of Satisfactory for a business course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Approved Dual Credit

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

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 Ph.D. degree must be recommended for acceptance by the College of Business Administration to The Graduate School. Actual admission is based on the applicant's overall standing compared with other applicants and on the availability of vacancies in each department. The Graduate School requires the Graduate School Application, transcripts from all previous college work, and additional information from international students. The college requires the Ph.D. Application, responses 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 remains.

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

Program of Study

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

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

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

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

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

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

Degree Requirements

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

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

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

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

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

3. Basic Core: Economics 510 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.

4. Research Tools: A minimum of 12 semester hours of graduate research methods must be completed. At least 6 semester hours in statistics courses beyond Statistics 531 are required. The remaining 3 semester hours may be completed in additional statistics courses (not to include Statistics 531) or in other areas such as research methodology, management science, computer science, econometrics, and psychometrics.

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

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

Comprehensive Examinations

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

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

Doctoral Committee

A doctoral student is advised to give serious attention early in the program to the composition of his/her doctoral committee. In accordance with Graduate School policy, the student and the cognate area are each required to select 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 completing 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 permits graduation in the following spring semester.)

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

Dissertation

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

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

GRADUATE COURSES

501-63 Integrative Management I, II (1,1) Introductory integrative managerial policy and strategy for MBAs only. Use of tools of analysis, data, information, design, and remediation to identify, solve, and correct problems in and of organizations.

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

509 Managerial Policy and Strategy (3) Strategy and policy that affect character and success of total enter-
THE MASTER'S PROGRAM

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

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


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

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

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

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

2. Completion of a critical review of the literature and other sources in an area related to chemical engineering (ChE 580).

GRADUATE COURSES

401 Chemical Engineering Data Analysis (3) Experimental data; identification of system extremes; statistical properties of correlation and regression; classical process control; optimization techniques.

403 Introduction to Optimization (3) Principles and applications of optimization techniques; an introduction to both classical and modern optimization techniques; linear and geometric programming. Prereq: Mathemat- ics 241.


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

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

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

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

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

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

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

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

525 Chemical Process Industry Economics (3) Evaluation of economics of chemical processes, deter-

mination of profits, risks and alternatives for process plants, decision making for investment in capital facili-
ties, market forecasting for chemical products. Prereq: 425, 490.

531 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solution; composition relationship between phases, solution behavior and approach to macromolecules; intro-
duction to microscopic approach to thermodynamics.

532 Statistical Mechanics (3) Molecular distribution functions, molecular simulations, diagrammatic expan-
sions, distribution function theories, perturbation theo-
ries, independent correlation functions, theory of transport processes, and phase transitions. Prereq: Background in mathematics, thermodynamics, transport phenomena, and computer programming.

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

542 Diffusive and Stagewise Mass Transfer Operations (3) Analysis of mass transfer processes, coupled mass transfer and reaction, mass transfer and chemical reaction in packed towers and agitated vessels, membrane separa-
tions. Equilibrium stage concepts applied to mass trans-
fer operation, emphasizing nonequilibrium and multicom-
ponent systems.

551 Chemical Reactor Analysis (3) Rate models for heterogeneous reactions, properties of porous cata-
ysts, catalyst deactivation, fluid-fluid and fluid-solid reac-
tors.

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

575 Applied Microbiology and Bioengineering (3) Grossdiscipline course combining basic concepts in microbiology, biotechnology, analytical chemistry, and bio-
chemical and environmental engineering. Commercial processes, biodegradations/wastewater treatment, analysis of basic bioreactor systems, biosensors, and immobilization methods. Fundamental laboratory tech-
niques during 6-week laboratory period. (Same as Envi-
ronmental Engineering 575 and Microbiology 575.)

576 Principles of Chemical Separations (3) Funda-
mental aspects of chemical and biochemical separa-
tion methods with emphasis on separations as unified fields; several chemical separation techniques with appli-
cation examples from both chemical and biochemical fields; development of predictive mathematical models.

577 Modeling and Design of Bioreactor Systems (3) Discussion of different classes of models: structured, unstructured, discrete and continuous. Parameter esti-
mation and model discrimination, methods for measure-
ment and model parameter estimation, integration and stoichiometric balancing. Shuler's model, Her-
bert's model, stability steady state analysis, dynamics, lag shift experiments. Discussion of economic models: batch, loop and continuous commercial bioreactors. Impor-
tant design considerations: analytic methods and bio-
sensors, oxygen and carbon dioxide, bioreactor design, gene transfer and sterilization. Advanced bioreactor concepts with emphasis on continuous operation. Col-
umn systems with immobilized biocatalyst. Funda-
mental understanding of bioreaction kinetics and system dynamics; process control and optimization. Prereq: 575.

580 Technical Review and Assessment (3) Prepara-
tion of critical review of literature in area related to chemical engineering. Limited to candidates in non-
thesis option. Prereq: Consent of advisor.

581 Industrial Waste Minimization (3) Principles and practical aspects of industrial waste minimization. Regu-

latory environment, waste minimization strategies, eco-

conomics, process safety, case study: analysis of alternative waste minimization/management technolo-
gies. Prereq: Graduate standing in engineering or con-
sent of instructor.

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

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

590 Special Topics in Chemical Engineering (3) May be repeated. Maximum 8 hrs.

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

625 Venture Analysis (3) One or more chemical engineering processes or products selected as basis for proposed business venture. Case study with attention to markets, manufacturing needs, cost estimation, and management and financial planning. To support decision-making or management by or potential investors. Prereq: 525 or equivalent.

631 Advanced Topics in Statistical Thermodynamics and Molecular Dynamics (3) Statistical thermodynamics, molecular based computer simulations, Monte Carlo and molecular dynamic calculations; applications to supercritical fluids, macromolecules and biological systems. Prereq: 531.


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


651 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. (Same as Environmental Engineering 675.)

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

Chemistry

(College of Liberal Arts)

MAJOR DEGREES

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

Gleb Mamantov, Head

Professors:

Baker, D. C., Ph.D. .................................. Ohio State
Bloor, J. E., Ph.D. .................................. Manchester
Bull, William E., Ph.D. ......................... Illinois
Chambers, J. Q., Ph.D. ...................... Kansas
Compton, R. N., Ph.D. ..................... Tennessee
Dean, J. A. (Emeritus), Ph.D. .......... Michigan
Eastham, J. F., Ph.D. ...................... California
Fletcher, W. H. (Emeritus), Ph.D. .... Minnesota
Grimm, F. A., Ph.D. ............................. Cornell
Guiochon, G. (Distinguished Scientist).
Ph.D. .................................. Ecole Polytechnic and Paris VI
Kabalka, G. W., Ph.D. ....................... Purdue
Kleinfelter, D. C., Ph.D. ..................... Princeton
Lietzke, M. H. (Emeritus), Ph.D. .... Wisconsin
Magee, P., Ph.D. ................................... Michigan
Magid, R. M., Ph.D. ............................... Yale
Mamantov, Gleb (Distinguished Prof.),
Ph.D. .................................... Louisiana State

Pagni, R. M., Ph.D. ......................... Wisconsin
Peterson, J. R., Ph.D. .................... California
Schweitzer, George K. (Distinguished Prof.),
Ph.D. .................................... Illinois
Smith, W. T. (Emeritus), Ph.D. .... Ohio State
VanHool, W. A., Ph.D. ..................... Johns Hopkins
Wehry, E. L., Ph.D. ............................... Purdue
Williams, T. F. (Distinguished Prof.),
Ph.D. ...................................... London
Wunderlich, B. (Distinguished Scientist),
Ph.D. ..................................... Northwestern

Associate Professors:

Adcock, J. L., Ph.D. ......................... Texas
Alexandratos, M. D., Ph.D. ........ California
Barnes, C. E., Ph.D. ....................... Stanford
Bartmess, J. E., Ph.D. ...................... Northwestern
Cook, K. D., Ph.D. ......................... Wisconsin
Kovac, J. D., Ph.D. ......................... Yale
Lane, C. A., Ph.D. ............................... California
Scheff, F. M., Ph.D. ......................... Indiana
Sepaniak, M. J., Ph.D. ....................... Iowa State
Woods, C., Ph.D. .............................. NC State

Assistant Professors:

Feiglere, C. S., Ph.D. ....................... Colorado Shibata, J. H., Ph.D. ................... Washington

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

THE MASTER'S PROGRAM

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

The requirements for the M.S. in Chemistry consist of the satisfactory completion of:
1. Research and a thesis to give 6 to 12 hours of graduate credit in Chemistry 500.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed remedial courses based on performance on entrance examinations.
4. Sufficient graduate coursework in chemistry (at the 400 level or above) and/or a related field to make an overall total of 30 hours, including one of the following sequences: 510-11-12, 530-31-32, 550-51-52-53-54, 570-71-72-73, and 590-94-95.
5. A final oral examination.

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

GRADUATE COURSES

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

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


471-81 Biophysical Chemistry (3,3) [Same as Biochemistry 471-81].

473-83 Physical Chemistry (3,3) Students may not receive credit for both 473 and 473L nor for both 483 and 483L. Prerequisites: 471-81-83-Principles of thermodynamics, chemical equilibria, simple phase equilibria; properties of solutions; introduction to statistical thermodynamics. 483-Kinetics of chemical reaction; introduction to quantum mechanics and applications to electronic structure of atoms and molecules; molecular spectroscopy. Prereq: General chemistry, fundamentals or elements of physics, and calculus. Sp

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

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

(College of Human Ecology)

MAJORS

DEGREES


Connie Steele, Head

500 Thesis (1-18) P/NP only. E

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

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

505 Special Problems (3) 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. F, Sp, Su

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

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

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

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

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

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

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

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

550 Structure and Reactivity in Organic Chemistry (3) Structure and bonding in organic molecules; molecular orbital theory, stereochemistry, conformational analysis, Maximum for structure; substituent effects on acidity and reactivity; introduction to reaction mechanisms. Prereq: 560. F


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

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

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

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

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

572 Thermodynamics and Statistical Mechanics (3) Microscopic and macroscopic description of equilibrium systems. Basic principles of thermodynamics and statistical mechanics and application to selected chemical systems. Prereq: 1 yr of physical chemistry. F

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

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

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


595 Physical Chemistry of Polymers (3) Conformation of macromolecules, solution and bulk properties, rubber elasticity, kinetics of polymerization, polymer thermodynamics, kinetic aspects of macromolecular reactions. Prereq: 594. Sp

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

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

610 Selected Topics in Analytical Chemistry (3) Topics of current significance. Prereq: 510-11-12 or consent of instructor. May be repeated. Maximum 12 hrs.

630 Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: 530-31-32 or consent of instructor. May be repeated. Maximum 12 hrs.

650 Selected Topics in Organic Chemistry (3) Topics of current significance. Prereq: Two of 550-51-52 or consent of instructor. May be repeated. Maximum 12 hrs.


670 Selected Topics in Physical Chemistry (3) Topics of current significance. Prereq: 570-72-73 or consent of instructor. May be repeated. Maximum 12 hrs.

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

Professors:

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

Associate Professors:

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

Assistant Professors:

Blinn, L. Ph.D. .......... Ohio State
Catron, C., Ed.D. .......... Vanderbilt
Smith, Delores, Ph.D. .......... Oklahoma State
Tegano, D., Ph.D. .......... Virginia Tech

The Department of Child and Family Studies encompasses two primary concentrations: child development and family studies. Integration of these 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 individual goals. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings. Because the doctoral degree is a research degree, students at this level receive substantial preparation in statistics and research methodology. Interested students should contact the department head.

ADMISSION REQUIREMENTS

A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section, and completion of three Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology. Admission to the program is contingent upon faculty evaluation of GRE scores, unweighted undergraduate/graduate GPA, rating forms, and work experience. Prerequisites for admission to the Master's or doctoral program are 9 semester hours of either upper division undergraduate or graduate social science.

THE MASTER'S PROGRAM

An individual program of study may be designed by the student in collaboration with his or her major professor and committee. The program provides for a concentration in either child development or family studies. Specializations in the child development concentration consist of early childhood education, early childhood special education, early childhood administration, and child development. Specializations in the family studies concentration consist of family life intervention and family science. Thesis and non-thesis options are available in both concentrations. All students in the child development concentration must enroll in CFS 510, 533, and 571. At least 6 hours in a cognate area outside the department must be completed. Thesis students are required to take the following: 3 hours of...
The doctoral program in Human Ecology prepares scholars in the concentration areas of child development and of family studies. The strength of the doctoral program is based on three major components: the integration of child development and family studies within the context of human ecology and related areas, concentration in child development or family studies, and an emphasis on becoming proficient producers and consumers of research. A doctoral program that is concurrently specialized and integrative in nature reflects the complexity of the disciplinary subject matter, provides a broader context to formulate theoretical questions, and broadens the empirical literature for addressing those questions.

Requirements include:
1. Minimum 10 credits in child and family studies, required foundation courses: 510, 650, 570, 571.
2. Minimum 12 credits in 500- and 600-level courses in child development or family studies, with at least 3 credits in 600-level courses (in addition to the required courses described in #1).
3. Minimum 6 credits in a cognate area.
4. Minimum 9 credits in graduate-level statistics, with at least 3 of these credits in a more specialized area than a sequence of survey courses.
5. Minimum 3 credits of specialized research methods.
6. Pre-doctoral research project approved by student's committee.
8. Minimum 8 credits of electives.

GRADUATE COURSES

500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: 3 hours of 500-level research methods, statistical methods, or interpretation of methods and statistics; CFS 564, 565; 9 hours of CFS courses in the area of specialization; and a written comprehensive examination. Students seeking the M.S. in Child and Family Studies are required to file a plan of study with the department head after 15 hours of graduate credit have been completed.

THE PH.D. CONCENTRATION

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

Requirements include:
1. Minimum 10 credits in child and family studies, required foundation courses: 510, 650, 570, 571.
2. Minimum 12 credits in 500- and 600-level courses in child development or family studies, with at least 3 credits in 600-level courses (in addition to the required courses described in #1).
3. Minimum 6 credits in a cognate area.
4. Minimum 9 credits in graduate-level statistics, with at least 3 of these credits in a more specialized area than a sequence of survey courses.
5. Minimum 3 credits of specialized research methods.
6. Pre-doctoral research project approved by student's committee.
8. Minimum 8 credits of electives.

GRADUATE COURSES

500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: 3 hours of 500-level research methods, statistical methods, or interpretation of methods and statistics; CFS 564, 565; 9 hours of CFS courses in the area of specialization; and a written comprehensive examination. Students seeking the M.S. in Child and Family Studies are required to file a plan of study with the department head after 15 hours of graduate credit have been completed.

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

Requirements include:
1. Minimum 10 credits in child and family studies, required foundation courses: 510, 650, 570, 571.
2. Minimum 12 credits in 500- and 600-level courses in child development or family studies, with at least 3 credits in 600-level courses (in addition to the required courses described in #1).
3. Minimum 6 credits in a cognate area.
4. Minimum 9 credits in graduate-level statistics, with at least 3 of these credits in a more specialized area than a sequence of survey courses.
5. Minimum 3 credits of specialized research methods.
6. Pre-doctoral research project approved by student's committee.
8. Minimum 8 credits of electives.
Chatterjee, A., Ph.D. .......... NC State
Davis, W. T., Ph.D. .......... Tennessee
Ghosh, M. (Goodrich Chair of Excellence), PE, Ph.D. .......... Illinois
Goodpasture, D. W., Ph.D. .......... Illinois
Grecco, W. L., Ph.D. .......... Michigan State
Heathington, K. W., PE, Ph.D. .......... Northwestern
Ph.D. .......... Northwestern
Humphreys, J. B., PE, Ph.D. .......... Texas A&M
Johnson, H. L., PE, M.S. .......... Tennessee
Miller, W. A. (Granger Prof.), PE, Ph.D. .......... Arizona
Moore, A. B., M.S. .......... Tennessee
Robinson, R. B. (Fisher Prof.), PE, Ph.D. .......... VPI
Smoot, J. L., PE, Ph.D. .......... Iowa State
Tiry, R. F. (Emeritus), PE, B.S. .......... Marquette

Assistant Professors:
Alavain, V., Ph.D. .......... Wisconsin
Bennett, R. M., Ph.D. .......... Illinois
Drumm, E. C., Ph.D. .......... Arizona
Hansen, J. H., Ph.D. .......... Missouri
Wright, J. M. (Emeritus), PE, M.S .. MIT

The Department of Civil Engineering offers degrees leading to the Master of Science and Doctor of Philosophy with a major in Civil Engineering concentrating in construction engineering, environmental engineering, geotechnical/materials engineering, public works engineering, structural engineering, and transportation engineering; to the Master of Science in Environmental Engineering with concentrations in water quality, water resources, air quality, mixed waste management, and waste management.

THE MASTER'S PROGRAM

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

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

Civil Engineering

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

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

Environmental Engineering

For a Master of Science with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: Basic Engineering or Computer Science 101; Basic Engineering 121, 131; Engineering Science and Mechanics 231, 321, Civil Engineering 390, 395, 380; Mathematics 141, 142, 213, 241; Chemistry 120, 130. In general, these must be completed with a B average before courses for graduate credit can be taken.

The Department of Civil 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 32 semester hours of approved graduate courses. The major shall include 6 semester hours of thesis and a minimum of 12 semester hours of approved environmental engineering coursework. A minor may be selected but is not necessarily required.

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

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

normally, the graduate program of study will be adjusted by the head of the department and the student's committee to suit the individual academic objectives.

THE DOCTORAL PROGRAM

A graduate program leading to the Doctor of Philosophy is offered in Civil Engineering.

Specific departmental requirements for the Ph.D. degree include the following:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis. Of this number, a minimum of 24 semester hours in 600 Doctoral Research and Dissertation will be required.

2. A minimum of 24 semester hours of graduate courses in civil engineering, exclusive of thesis or dissertation credit, at least 6 hours of which must be 600-level courses.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 24 semester hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 9 semester hours of mathematics will be required beyond the civil engineering undergraduate requirements.

4. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research effort is required.

5. Upon completion of at least one-half of all coursework, each student must pass a comprehensive examination.

6. After completion of the dissertation, prior to graduation, each student must pass a comprehensive examination administered by a faculty committee.

ACADEMIC COMMON MARKET

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

Civil Engineering

GRADUATE COURSES

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

410 Land Surveying (3) Procedures of locating proper- ties; legal requirements; procedures to describe prop- erty, to create land division, and to prepare plots; laws of land surveying. Prereq: 210.

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

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; appli- cation of various engineering principles and techniques to processes 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 interrelationships; 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 con- figuration, airfield capacity, geometrics and terminal layout and design. Railroad capacity, geometrics and system layout and design. Prereq: 210, 251, 352.

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

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

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

485 Principles of Geohydraulics (3) (Same as Geo- logical 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.

494 Urban Drainage Engineering (3) Design and management of stormwater conveying and control structures. Application of hydrologic and hydraulic prin- ciples to design of for urban, strip mining, and highway development; design of inlet struc- tures, culverts, and detention/retention basins; application of commonly-used computer runoff models;
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
506 Seminar (1) Reports on current research in civil engineering at UTK. Prereq: Graduate standing.
510 Urban Systems: Engineering and Management (3) Various urban systems usually under responsibility of city manager and/or city engineer: streets, lighting, water, sewerage, refuse collection, Personnel management, finance, planning and public relations. Prereq: Graduate standing.
530 Shear Strength and Earth Slope Stability (3) Shear strength of fine graded soil from perspective of ideal, simple clay. Drained and undrained shear strength and stress-strain behavior of real soils. Laboratory testing. Stability of natural and cut slopes and embankments. Prereq: 335.
531 Soil Stabilization (3) Mechanical stabilization of soils by compaction, drainage, and blending; chemical stabilization of soils with admixtures, waterproofing and modifying of soils and additives. 2 hrs and 1 lab.
535 Advanced Foundations and Retaining Structures (3) Planning subsurface investigations; bearing capacity and settlement of shallow foundations on layered, semi-soft soils and rocks; sand and gravel fillers; foundation design with pressure-meter; lateral earth pressures and design of retaining structures and shafts. Prereq: 335.
539 Geomechanics Seminar (1) Seminar topics in materials, geotechnical engineering and geomechanics. Graduate student research contributions and practical applications presented by practicing engineers from community. Prereq: Graduate standing and consent of advisor. May not apply toward degree. May be repeated. S/NC only.
541 Construction Management II (3) Management organization of heavy and building construction projects. Prereq: 340.
543 Construction Estimating (3) Project costs, estimating methods and cost control techniques, man cost control, use of computers to control costs and feasibility of design to cost. Prereq: 340 or consent of instructor.
551 Traffic Engineering-Characteristics (3)Driver-vehicle-roadway system; traffic flow modeling; elements of transportation-highway safety. Prereq: Graduate standing.
552 Traffic Engineering-Operations (3) Signs, signals and marketing; short-term operations; controllers; signal timing/ phasing; one-way reversible flow; system operations; identification and correction of high-accident locations and system deficiencies. Prereq: 551 or 452.
553 Geometric Design and Layout of Roadways and Community Facilities (3) Urban geometry and functional design and rural and urban roads of all classes; subdivision layout; configuration of urban roads of all classes; techniques for access control and location of highways and street intersections; and parking. Prereq: 451 or consent of instructor.
554 Urban Transportation Planning (3) Transport systems: urban goods movement, transportation system management. Prereq: 352 or graduate standing.
555 Public Transit Planning (3) Characteristics of transit modes--conventional and paratransit; operational design of transit services; route planning and scheduling; cost analysis; mode choice models; performance evaluation, transit funding and financing. Prereq: 554 or graduate standing.
556 Traffic Accident Reconstruction (3) Data collection and analysis as basis for accident prevention on control programs; roadside hardware design and crash testing. Prereq: 452 or graduate standing.
557 Transportation Planning and Operations with Micro-Computer Applications (3) Transportation system management techniques and application of micro-computers to analysis of transportation actions. Prereq: 551, 554.
558 Planning and Transportation (3) Preparation of transportation as elements of comprehensive development plans. Analysis of relationship between various transportation modes and between transportation and other community features. Use of planning process to establish external inputs to computer model and to demand for proposing alternatives and evaluation. Prereq: Graduate standing. (Same as Planning 537.)
561 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, solution techniques; direct stiffness analysis of plane trusses, general members, and structures composed of general members. Prereq: 361.
562 Analysis and Design of Plate Structures (3) Plate bending and buckling theory; analysis and design of bridge and building floors and structural plate components. Prereq: 361.
563 Spatially Indeterminate Structures (3) Deflections of loaded trusses; force methods; moment distribution and other displacement methods; secondary stresses. Prereq: 361.
564 Finite Element Structural Analysis (3) Application of finite element method to structural analysis; plane stress, plane strain, axisymmetric, and three-dimensional elements; use of typical computer programs. Prereq: 561.
565 Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom; elastoplastic behavior considered. Application to earthquakes, fatigue. Prereq: 472.
566 Structural Reliability (3) Application of probability theory and statistics to evaluating reliability of structures; development of safety factors and probability based design codes. Prereq: 561.
571 Behavior of Steel Structures (3) Behavior of steel structures due to static and fatigue loading; relation of design charts and current specifications for design. Prereq: 471.
572 Connections for Structural Steel Frames (3) Design, analysis and behavior of connections for structural steel frames. Simple, rigid and semi-rigid connections; columns, beams and column splices. Prereq: 472.
573 Prestressed Concrete (3) Properties of pre-stressing materials; methods of post-tensioning; analysis and design of simple and continuous beams and slabs. Prereq: 471.
574 Behavior of Reinforced Concrete Members (3) Material and analysis of concrete; design of reinforcing; design of reinforced concrete beams; combined bending and axial load; shear and torsion; relation between research results and specifications for design. Prereq: 471.
575 Repair and Retrofitting of Structures (3) Techniques, methods, and materials for repair and retrofitting of deteriorated or overstressed structures. Foundation underpinning, retrofitting of steel fatigue failures. Prereq: 472.
588 Measurement Science I (3) (Same as Nuclear Engineering 588, Mechanical Engineering 588, Engineering Science and Mechanics 588, Electrical and Computer Engineering 588, Mechanical Engineering 588, and Aerospace Engineering 588.)
589 Measurement Science II (3) (Same as Nuclear Engineering 588, Chemical Engineering 589, Engineering Science and Mechanics 589, Electrical and Computer Engineering 589, Mechanical Engineering 589, and Aerospace Engineering 589.)
590 Special Problems in Civil Engineering (1-6) Enrollment limited to civil engineering students in non-thesis, 6 hrs. S/NC only.
595 Special Topics (1-4) Problems and topics related to current developments in field. May be repeated. Prereq: Consent of instructor.
596 Special Readings (1-4) Readings related to current developments in field. May be repeated. 600 Doctoral Research and Dissertation (3-15) P/NP only. E
537 Numerical Models for Geologic Materials (3) Numerical models to represent the stress/strain/volume relationships for soils, rock, concrete; nonlinear soil models, classical plasticity models; critical state and cased plasticity models; multiple surface models; determination of parameters from laboratory tests; numerical implementation. Prereq: 530 and Engineering Science and Mechanics 539.
539 Soil Dynamics (3) Behavior of soils and soil-structure systems under time dependent loading; wave propagation in elastic media; principles of seismic reflection techniques; effects of earthquakes and vibrating machines on soils and foundations; dynamic and cyclic soil testing and determination of soil parameters. Prereq: 335 and 565 or Engineering Science and Mechanics 431.
651 Analysis Techniques for Transportation Systems I (3) Analysis techniques; modal split and traffic assignment, employing mathematical, statistical, and computer science techniques. Static, dynamic and new modeling techniques. Prereq: 554 or 558.
652 Analysis Techniques for Transportation Systems II (3) Advanced topics of application of mathematical, statistical, and computer science techniques in modeling and analysis of transportation systems. Prereq: 651.
666 Advanced Structural Reliability (3) Monte Carlo methods; methods of propagation of uncertain variables subject to static and dynamic loading. Prereq: 571.
671 Behavior of Steel Bridges and Buildings (3) Behavior, analysis and design of plate girders, columns, and composite sections subjected to static and dynamic loading. Prereq: 571.
691 Special Topics in Civil Engineering (3) Selected advanced problems of current interest. Prereq: Consent of instructor. May be repeated.

Environmental Engineering

GRADUATE COURSES

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

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

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

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

520 Open Channel Hydraulics (3) Open channel flow principles, properties, and classifications; uniform and gradually varied flow theory and applications; open channel design; unsteady flow theory and analysis: dissolved oxygen, suspended solids, and storm flow; floodplain and microcomputar applications, featuring HEC-2 model. Prereq: Civil Engineering 390.

522 Floodplain and Urban Flood Management (3) Review of floodplain regulations and systems; mobile state of the art flood damage reduction alternatives; structural and non-structural; institutional responses: policies, programs, organizations, regulations, legal aspects; floodplain hydrology and hydraulics, HEC-1, HEC-2; floodway encroachment, flood hazard zone and determination of flood damages cost. Prereq: Civil Engineering 390 or consent of instructor for non-majors.

524 Sediment Transport (3) Sediment properties and measurements; principles of dynamics of suspended and bed sediment transport in erodible channels; erosion, transportation, and deposition of sediment by flow and water, erodible channel design; channel regime theory; common computer models. Prereq: Civil 350.


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 485 or consent of instructor. (Same as Geological Sciences 535.)

540 Remote Sensing for Transportation and Facilities Siting (3) Principles of remote sensing; sources of data; non-sensor systems; photographic interpretation; analog and digital techniques for analysis of aerial and terrestrial photos, radar and thermal imagery with applications to transportation, urban design and construction and operations. Prereq: Consent of instructor.

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

551 Physicochemical Unit Processes (3) Theory and design application in water and wastewater treatment. Prereq: Civil Engineering 380, and Civil Engineering 390.

552 Biological Treatment Theory (3) Theory and design application of biological processes for the treatment of wastewater and solid wastes. Prereq: Civil Engineering 380, 2 hrs and 1 lab.

553 Environmental Engineering Chemistry (3) Theoretical, applied and analytical chemistry related to determination, measurement and treatment of environmental contaminants. Prereq: Chemistry 130. 2 hrs and 1 lab.

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

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

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

571 Design of Air Pollution Control Systems (3) Design and evaluation of systems used to control emissions from industrial processes; ambient air monitoring instrumentation/techniques. Prereq: Consent of instructor.

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

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

575 Applied Microbiology and Bioengineering (3) (Same as Chemical Engineering 375 and Microbiology 375.)

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

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

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

620 Advanced Surface Water Hydraulics (3) Advanced topics in surface water hydraulics; solutions to St. Venant equations of unsteady flow for complex channel situations; dam breach modeling. Prereq: 520.

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

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


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

675 Microbial Systems Analysis (3) (Same as Chemical Engineering 675.)

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

Classics

(College of Liberal Arts)

Harry C. Rutfedge, Head

Professors:

Gesell, G. C., Ph.D. North Carolina
Rutfedge, H. C., Ph.D. Ohio State

Associate Professors:

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

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

GRADUATE COURSES

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


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

414 Cicero and Techniques of Latin Prose Composition (3) For advanced students in Latin, practice in prose composition, writings of Cicero the model. Prereq: 351-52 or consent of instructor. Sp

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

431-32 Selected Readings from Latin Literature (3,3) For advanced students in Latin, oratory, historical writings, poetry of ancient Rome in original Latin. Prereq: 251-352 or consent of instructor. May be repeated. Maximum 9 hrs.

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

441 Special Topics in Classical Civilization (1-3) Art, literature, religion, and society of Greece and Rome. May be repeated with consent of department. Maximum 9 hrs.

461 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in an existing course, or concentrating on one aspect of existing survey. Prereq: According to topic. May be repeated. Maximum 9 hrs.

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

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

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

(College of Communications)

MAJOR

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

Professors:

Ashdown. Paul G., Ph.D. .......... Bowling Green
Crook, James A., Ph.D. ............ Iowa State
Evertt, George A., Ph.D. .......... Iowa
Holt, Darrel W. (Emeritus), Ph.D. Northwestern
Howard, Herbert H., Ph.D. ........ Ohio
Leiter, B. Kelly (Emeritus), Ph.D. Southern Illinois
Taylor, Ronald E., Ph.D. .......... Illinois

Associate Professors:

Buchman, Joseph, Ph.D. .......... Indiana
Hoy, Mairea, Ph.D. .......... Oklahoma State

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

For application forms and other information about the M.S. and Ph.D. programs in Communications, write to: Assistant Dean for Graduate Studies, College of Communications, 426 Communications Building, The University of Tennessee, Knoxville, TN 37996-0347.

ADMISSION REQUIREMENTS

Applicants must meet admission requirements of The Graduate School. 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 of potential candidates status normally include a 3.0 (4.0 below) grade-point average in undergraduate studies and scores above the 50th percentile in verbal and quantitative 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 Master's or Doctoral Committee of the College of Communications.

Students who have had no courses in their major area of concentration may expect to spend four or more full-time semesters in the program, including a media internship.

ACADEMIC COMMON MARKET

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

ACADEMIC STANDARDS

A student in the College of Communications whose graduate grade-point average, not including incomplete grades, is below 3.0 at any time after the end of 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 at the end of the probationary period. The probationary period is defined as the next 12 semester hours of graduate coursework attempted that is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Studies of the College of Communications on the recommendation of the student's faculty committee.

THE MASTER'S PROGRAM

The Master of Science with a major in Communications is intended for students who desire a career in the mass media with an emphasis on communications management and a deeper understanding of the communication process and social role of the mass media. The program follows a broad-based multi-media approach while allowing the student to concentrate in one of four fields: advertising, broadcasting, journalism, or public relations. 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.

Degree Requirements

The M.S. program emphasizes communications management in the areas of advertising, broadcasting, journalism (publications), and public relations. For the thesis option, a minimum of 31 hours of approved graduate work is required. The non-thesis option requires 34 hours.

1. Ten hours of core courses—Communications 510, 512, 540, and 550, the first three of which must be taken during the first two semesters of the student's program, except with written approval of the Assistant Dean for Graduate Studies for the College.

2. Twelve hours within one department of the college, at 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 599), including a thesis seminar or a 3-hour project (Communications 590).

Additional hours may be required for those who do not have academic prerequisites, and an internship may be required for those who do not have professional experience in the field they wish to study. A course in communications law is a prerequisite.

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 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 must be taken during the fall semester of the first academic year.

The Master's degree is not required for entry into or completion of the doctoral program. Program planning, however, will permit the Master's degree to be obtained if desired. Students lacking academic or professional experience in communications will be required to take prerequisite courses. In general, however, the program may be completed within three academic years of full-time study beyond the Bachelor's degree. Those holding Master's degrees should anticipate two or more years of full-time study for completion of the Ph.D.
anatomy, histology, cell biology, or other appropriate biomedical courses from a recognized 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.

Requirements for Admission to the Doctor of Philosophy Program
Applicants will generally be expected to have a Master's degree in one of the biological sciences or a related field, or equivalent, or a Bachelor's degree in one of the medical sciences, (e.g., M.D., D.D.S., D.V.M.). 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 Knoxville may be enrolled in the Comparative and Experimental Medicine graduate program but will be listed officially as veterinary students. Such students may take advantage of enlisting in graduate courses during summers and as elective courses in the veterinary program.

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

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs. The M.S. and Ph.D. programs in Comparative and Experimental Medicine are available to residents of the state of Kentucky. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Computer Science
(College of Liberal Arts)

MAJOR DEGREES

Computer Science .................................. M.S., Ph.D.

Jesse H. Poore, Head

Professors:


Associate Professors:

Case, Jeffrey D., Ph.D. .................................. Illinois Langston, Michael A., Ph.D. ........................ Texas A&M Leuze, Michael, Ph.D. ............................. Purdue MacLennan, Bruce J., Ph.D. ....................... Purdue Whitehead, Bruce (UTSI), Ph.D. ............... Michigan

Assistant Professors:


Instructor:

Mayo, J. W., M.S. .................................. Tennessee

THE MASTER'S PROGRAM

One year of college mathematics beyond algebra and trigonometry is required for admission. For the master's degree, 30 semester hours of graduate credit are required, 24 of which must be 500 level or above, 511, which cannot be counted toward the 30 semester hours, is available to students who need a stronger background in software; one course in programming in a modern recursive, high-level language is the prerequisite to 511. Graduate courses outside the department are allowed but must be approved by the Graduate Committee before enrollment.

Thesis Option

The student must make agreement on a thesis topic with a faculty advisor and must take 6 hours of 500 Thesis. Six hours of 500 Thesis may count in the 24-hour requirement at the 500 level or above.

Non-Thesis Option

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

Master's Minor in Computer Science

The graduate minor consists of 51 or its equivalent plus an additional 6 hours of computer science graduate level courses at or above the 400 level.

THE DOCTORAL PROGRAM

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

1. The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student's potential for advanced work in computer science (for example, college teachers or employers for whom the student has worked after earning a Bachelor's degree). The department reserves the right to contact these individuals or other knowledgeable people if additional information is deemed necessary or desirable.

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

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

Original research reported in a dissertation of high quality is emphasized. The minimum hour requirements are 24 hours of course 600 (Doctoral Research and Dissertation) and 24 hours of graduate courses beyond the equivalent of a Master's degree (beyond 30 graduate credit hours) graded A-F. The 24 hours of courses must include at least six semester hours of 600-level courses taken in computer science at UT Knoxville. The student's advisor and committee will establish the specific course requirements. The comprehensive examination consists of a departmental written examination and a subsequent oral examination conducted by the student's committee.

GRADUATE COURSES

401 Applications of Computer Graphics (3) Commercial software, techniques, hardware. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

402 Applications of Artificial Intelligence (3) Commercial software, techniques, hardware. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

403 Applications of Microcomputers (3) Microcomputers, DOS, commercial software and hardware. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

404 Applications of Database Systems (3) Commercial software, techniques, hardware. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

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

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

423 Natural Language Processing (3) Phase-structured and slot grammars, error-correcting interfaces and semantics. Applications in database and expert systems. Prereq: 361 and 421.

424 Robotics Software (3) Software for robotic control. Prereq: Computer Organization, Data Structures, and Calculus. 3 hr lab required.

425 Functional Languages (3) Functional, applicative and object-oriented languages, LISP and SMALLTALK, used for research applications. Prereq: 111, 112 and Mathematics 522. 3 hr lab required.

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

433 Computer Systems Architecture (3) Parallel processing, memory, I/O, pipelines, specialized architectures. Prereq: 331 and 360.

434 Networks and Communications (3) OSI open system interconnection model, protocols, study of several existing wide area networks, local area networks. Prereq: Systems Programming.

435 Microcomputer Systems (3) Disk operating systems, peripherals, local area networks and communication protocols. Introduction to microcomputer systems. Prereq: Systems Programming. 3 hr lab required.

436 Computer Systems Hardware Design (3) Computer hardware: bus structures, I/O devices, interrupt support hardware, direct memory access logic, timing budgets, and system considerations. Lab: construction, testing and debugging of either or both of prototyped subsystem; system based on commercially available microcomputer component devices. Prereq: 435.
439 Microprogramming (3) Microprogramming concepts and techniques for control systems of large and small machines. Bit-slice architecture, sequences. Prereq: Computer Organization and Data Structures. 3 hr lab required.

441 Science Information Systems (3) Design of scientific data banks, document repositories, information retrieval and electronic dissemination services. Control and dissemination of scientific information at national and international level. Prereq: 340.

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

443 Introduction to Information Storage and Retrieval (3) Information storage and retrieval, statistical, syntactic, and logical analysis of information content, evaluation of retrieval effectiveness. Prereq: 340.


451 Pattern Recognition and Analysis (3) Elements of syntactic pattern recognition, learning algorithms, decision, classification, rule extraction. Prereq: 111, 112 and 311. 3.3 hr lab required.

452 Image Processing and Analysis (3) Methods for digitizing, storing, processing, and displaying images. Image enhancement, restoration. Prereq: 451. 3 hr lab required.

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


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

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


465 Parallel Computation I (3) Examination of parallel algorithms. Prereq: 360. 3.3 hr lab required.


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

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


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

483 Information Theory (3) Theory of communication. Entropy, efficient transmission and storage at information.

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

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when use for research equipment or devices has been approved by faculty before degree is completed. May not be used toward degree requirements. May be repeated. S/NCG only. E

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

521 Artificial Intelligence (3) Heuristic search, automatic theorem proving, symbolic methods, semantic information processing, representation theory. Prereq: 511 and 513.

522 Cybernetics (3) Various functions in living systems and their actual or potential realization in computers. Prereq: Discrete Structures and 511.

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

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. Prereq: 521.


535 Computer Architecture (3) Parallel processing concepts, pipelining, vector processors, functional units, memory organization and control, data flow, reduced instruction sets, symbolic processors. Prereq: 511 and 532.


538 Computer Networks (3) Design and operation of networks. Hardware and software systems; communications subsystems. Prereq: 511 and 532.

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

544 Information Storage and Retrieval (3) Organization, storage and retrieval of bibliographic data, analysis of commercial IR systems; information analysis and automatic dictionary and thesaurus construction; statistical and syntactic approaches to content analysis. Prereq: 511.

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

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

556 Language Design (3) Description, structure, and design philosophies of high-level languages. Names, types; control and data structures; abstraction and modularity. Design project. Prereq: 511.

563 Operating Systems (3) Operating system design, alternative constructs of memory, device, and process allocation and management. Protection, time sharing, real-time systems. Memory management, dispatchers, interrupts. Design project. Prereq: 511.

571-72 Numerical Mathematics (3) (Same as Mathematics 571-72.)

573 Finite Difference Methods for Partial Differential Equations (3) (Same as Mathematics 573.)

574 Finite Element Methods (3) (Same as Mathematics 574.)

575 Matrix Theory and Techniques in Numerical Analysis (3) (Same as Mathematics 575.)

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


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

594 Special Topics in Computer Science (1-3) May be repeated. Maximum 6 hrs.

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

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

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

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

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

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

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

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

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

72 Curriculum and Instruction

727 Curriculum and Instruction (College of Education)

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

J. Estill Alexander, Acting Head

Professors:
Alexander, J. Estill, Ed.D ............ Kentucky
Allison, G. B., Ph.D .......... Oklahoma
Bellon, Jerry J., Ed.D ............ California
Blank, Kermit J., Ph.D ........... Ohio State
Butefish, William L., Ed.D .......... Texas Tech
Christensen, Mark A., Ph.D ......... Kansas
Davis, A. R., Ph.D ......... Ohio State
Dessart, Donald J., Ph.D .......... Maryland
encompasses concentrations in the following areas: curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, social science education.

THE DOCTORAL PROGRAM

The Ed.D. program in Curriculum and Instruction may include concentration upon the following fields of study: social foundations, educational research, elementary education, English education, foreign language education, mathematics education, science education, social science education. The Doctor of Philosophy with a major in Education includes concentrations and specializations as listed under Education.

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program (concentration in foreign language education only) in Curriculum and Instruction is available to residents of the state of Louisiana. The Ed.S. program (concentration in reading education only) in Curriculum and Instruction is available to residents of the state of South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

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

422 Elementary and Middle School Teaching Methods I (6) Methods and materials (knowledge base) for teaching reading, language arts, mathematics, science and social studies. Extensive assessment, unit planning, daily planning, evaluation, etc., and language and concept development. Prereq: Admission to teacher education. F, Sp

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

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

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

443 Elementary and Middle School Mathematics Instruction (3) Procedures for helping children learn mathematics. Unit planning, daily planning, grouping, general factors related to classroom management. Not open to students with recent course in teaching of mathematics. Prereq: Admission to teacher education. F, Sp


451 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of cultural influence) to understanding educational processes, problems, and thought in our society and others.

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

455 Teaching of Foreign Languages, Grades 7-12 (3) Instructional methods, lesson planning, peer-teaching; materials for teaching foreign language and culture; evaluation techniques. 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 Program.

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

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

461 Developing Reading Skills in Content Fields (3) Techniques for teaching reading and study skills in contexts of actual schoolcurricula. Prereq: Admission to Teacher Education Program. F, Sp

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

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

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

496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education programs for secondary schools. Prereq: Admission to teacher education. F, Sp

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

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


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

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

506 Teaching Poetry Grades 7-12 (3) Research and theory in application to teaching of poetry. Design of poetry programs, preparation of teaching and writing and reading of poetry. Review of textbooks and materials. F

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

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


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

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

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

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

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

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

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in curriculum, development of concepts and generalizations, integration of social sciences. Prereq. Course in teaching of social studies or consent of instructor. Sp

522 Teaching Mathematics in Elementary and Middle Schools (3) Instructional strategies for helping elementary school children learn mathematics. Examination, development and use of materials for creating active learning environment. Prereq.: 443 or equivalent or consent of instructor. F, Su

523 Diagnosis and Correction of Children's Difficulties in Basic Reading, Writing, and Arithmetic (3) Diagnosis and correction in reading, writing, and arithmetic difficulties in learning mathematics and procedures for helping classroom teacher correct difficulties. Prereq.: 522 or equivalent. F, Su


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

526 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. F, Su

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

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

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

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

531 Teaching Science in Elementary and Middle Schools (2) (3) Recent trends and current materials and content in teaching elementary school science. Prereq.: Course in teaching elementary school science or consent of instructor. F

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

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

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

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

536 Psychology of Reading (3) Reading act, relationship between learning theory and reading, role or reading in 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 diagnosis and correction of classroom reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Sp

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

539 Practicum in Remediation of Reading Problems (2) Application of learning and teaching methodology in working with elementary and/or secondary school students. Prereq. Consent of instructor. May be repeated. Maximum 4 hrs. Sp

540 Topics in Improvement of Instruction (1-3) Special conferences, workshops, and inservice programs. May be repeated. Maximum 6 hrs. S/N only. E

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. E

542 Development of Educational Thought (3) Historical and philosophical approaches to lives and writing of influential educators: Plato, Quintillian, Cornenius, Rosseau, Pestalozzi, Froebel, Dewey. Prereq.: Graduate status and consent of instructor. Sp, Su

543 Foundations of Educational Policy (3) Relationship between policy, philosophy, and social institutions as related to goals of students' programs. Prereq.: Consent of instructor. F

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

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

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

547 Topics in Philosophy of Education (3) May be repeated. E

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

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

552 Developmental Reading Practicum (2) Diagnosing and correcting reading disorders. Development of individual reading corrective reading needs. Prereq.: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 4 hrs. E

557 The Junior High and Middle School Curriculum (3) Curriculum and instructional design for junior high and middle school. Characteristics of students, curricu-
581 Seminar in Mathematics Education (3) Current issues influencing instruction in mathematics in elementary through college. Related teaching methodologies. Opportunities for work on special problems. Prereq: Undergraduate course in teaching of mathematics. Su

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


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

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

587 Teaching Foreign Languages in Secondary Schools (3) Advanced instructional techniques and evaluation of foreign languages and materials in schools. May be repeated. Maximum 9 hrs. S/NC only. E

590 Field Experience (1-3) Application of curricular and instructional approaches in social studies, and materials in schools. Prereq: Program prerequisites and consent of instructor. May be repeated. Minimum 9 hrs. S/NC only. E

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

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

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

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

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

596 Teaching of Natural Science and Environmental Education (3) Strategies, laboratory techniques, assessment, current programs and professional guidelines for middle, junior and senior high schools, and community colleges. Prereq: Consent of instructor. F

597 Teaching Drama Grades 7-12 (3) Strategies and materials for teaching creative dramatics, enacting and writing of plays, reading of scripts. Sp

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

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

600 Doctoral Research and Dissertation (3-15) Pr NP only

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

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

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

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

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

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

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

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

623 Programs for Curriculum Improvement (3) Research methodology, application to descriptive/ethnographic studies. Prereq: recent course in research methodology. Prereq: recent course in descriptive/ethnographic areas. Sp

625 Seminar in History of Education (3) Selected historical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. Sp

628 Advanced Studies in Elementary School Science (2) Current research in elementary school science as applied to classroom practice. Prereq: Graduate course in science education or equivalent or consent of instructor. May be repeated. Maximum 4 hrs. E

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

640 The Dynamics of Educational Change (3) Interdisciplinary approach to change process in education. Prereq: Consent of instructor. Sp

648 Topics in Sociology of Education (3) May be repeated. Sp

650 Advanced Studies in Early Childhood Education (3) Principles and practices of curriculum development and instruction applied to classroom practice. Prereq: Graduate course in early childhood education and consent of instructor. Maximum 6 hrs. S/NC only. E

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

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


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

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: 561. Sp, Su

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

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

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

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

685 Educational Leadership: Theory and Practice (3) Theoretical and leadership applied to variety of educational settings. Prereq: Consent of instructor, F, 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 Readings (1-3) May be repeated. S/NC or letter grade. E

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

596 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental protection. Projects, methods and research for middle, junior and senior high schools, and community colleges. Prereq: 596 or equivalent and consent of instructor. Sp

Ecology (College of Liberal Arts)

MAJOR

DEGREES

Ecology........................................ M.S., Ph.D.

Dewey L. Bunting, Director

J. Larry Wilson, Associate Director

Paul A. Delcourt, Associate Director

Shared Faculty:

Adams, Marshall, Ph.D., ORNL
Amundsen, C. C., Ph.D., Botany
Bartell, Steve, Ph.D., ORNL
Blaylock, B. G., Ph.D., ORNL
Boake, Christine R. B., Ph.D., Zoology
Buckner, E. R., Ph.D., Forestry, Wildlife & Fisheries

Butler, Dewey L., Ph.D., Zoology
Butler, C. M., Ph.D., Psychology
Clebsch, E. E. C., Ph.D., Botany
O'Brien, C. C., Ph.D., ORNL
DeAngelis, D. L., Ph.D., ORNL
Dearden, B. L., Ph.D., Forestry, Wildlife & Fisheries

Delcourt, Paul A., Ph.D., Geology
Dimmick, Ralph W., Ph.D., Forestry, Wildlife & Fisheries

Drake, James A., Ph.D., Zoology
Ehrenbach, Arthur C., Ph.D., Zoology
Eiwood, J. W., Ph.D., ORNL
Emmanuel, William, Ph.D., ORNL
Etner, D. A., Ph.D., Zoology
Evans, A. M., Ph.D., Zoology
Farkas, Walter, Ph.D. Environmental Practice
Fribourg, Henry A., Ph.D., Plant & Soil Science
Gardner, R. H., Ph.D., ORNL
Gehrs, C. W., Ph.D., ORNL
Economics

GRADUATE COURSES

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

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

510 Special Problems in Ecology (1-3) Individual investigation in ecology. May be repeated with consent of instructor. Maximum 6 hrs.

520 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. Appropriate for students in Planning and Environmental Engineering.

530 Implementation of Environmental Policy (3) Goals and problems of environmental legislation, National Environmental Policy Act, purpose, preparation, and evaluation of environmental impact statements and similar interdisciplinary studies. Prereq: 520 or 573 or course work or experience in environmental law.

537 Natural Resource Management and Environmental Assessment in Developing Nations (3) Assessment of environmental and resource development issues. Scientific basis for integrated resource management and environmental assessment in developing nations. Prereq: General ecology or equivalent. (Same as Planning 553 and Botany 537.)

552 Development Planning in the Third World (3) (Same as Planning 552.)

555 Environmental Planning (3) (Same as Planning 555.)

561 Environmental Toxicology (3) (Same as Biochemistry 561.)

562 Techniques in Environmental Toxicology (1) (Same as Biochemistry 562.)

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

574 Communities and Ecosystems (3) Patterns underlying principles behind short and long term community and ecosystem organization, dynamics, energetics and nutrient cycling.

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

604 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 604.)

610 Special Topics in Ecology (3) Seminars on advanced topics and recent developments. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

620 Seminar in Ecology (2) May be repeated. Maximum 12 hrs.

637 Applied Ecology (3) Review of contemporary and historical issues. Analysis of scientific basis of environmental assessment and natural resource management. Analysis of careers and career planning in applied ecology. Prereq: 573-74 or equivalent or consent of instructor. (Same as Botany 637.)

Economics

(Major of Business Administration)

MAJORS

ECONOMICS: B.A. (Majors: Economics)

MAJORS

DEGREES

Economics.......................... M.A., Ph.D.

Business Administration.................. MBA

Anne Mayhew, Head

Professors:

Bohm, Robert A., Ph.D. Washington (St. Louis)

Bowly, Roger L., Ph.D........................... Texas
THE DOCTORAL PROGRAM

Admission to the Ph.D. program is based on promise of outstanding scholarship as demonstrated by previous academic performance and by scores achieved on the general portion of the GRE. Requirements for successful completion of the program consist of the four components listed below.

1. Students are required to complete the following core requirements:
   a. Economic Theory: Microeconomic theory by comprehensive examination or by completion of 511, 512, 513, and 514. A maximum of 6 hours may be in an area other than economics.
   c. Mathematical and Quantitative Economics: 581, 582. The 582 requirement may be waived for students completing 681, 682.
   d. Students must achieve a grade average of B or higher over the courses offered to fulfill requirements in subparagraphs b and c, or, as an alternative, may petition to satisfy either or both of these two core areas by some other means such as a comprehensive written examination.

2. Students are required to demonstrate their competence by comprehensive examination in two fields of specialization with the approval of the department, at least one of which must be selected from the following: comparative systems, economic development, economic history, economics of labor and human resources, industrial organization, international economics, public finance, and regional and urban economics.

3. Students are required to complete with a grade of C or better two elective economics courses at the 500 level or above, outside the core subject areas and outside the two fields of specialization.

4. Students are required to complete a dissertation, including an oral defense, to give at least 24 hours of graduate credit (600).

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements, see Business Administration. MBA Concentration: Economics. Minimum course requirements are as approved by the area MBA faculty advisor.

GRADUATE COURSES

400 Special Topics (3) Topics vary. Prereq: Determined by department.

413 Macroeconomic Fluctuations (3) Analysis of historical data, methods of analyzing macro-economic fluctuations, theoretical explanations of cycles, and role of monetary and fiscal policies in aggregate economics. Prereq: Intermediate Macroeconomics or consent of instructor.

415 History of Economics (3) Methods of study of doctrinal history. Origins and evolution of major doctrines, historical and economic analysis, biographies of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. Prereq: 201 or equivalent and consent of instructor.

424 Political Economy of World Development (3) Topics vary: Latin America, Asia, Soviet Union and Eastern Europe. Analysis of major economic strategies, policies, and problems. Prereq: 201. This course includes a major writing requirement. May be repeated when topic varies. Maximum 9 hrs.


442 Analytical Labor Economics (3) Problems connected with labor market, intensive treatment of small number of topics. Health economics, economics of education, discrimination, fiscal federalism, public investment, social decision making. Prereq: 201.

462 Economics of Resources and Environmental Policy (3) Economic analysis of environmental and allocation of resources. Benefits and costs of development and use of natural resources, role of government policy in growth 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. 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. Prereq: 201.


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

501 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and application of optimizing techniques.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities, extends for the student not otherwise registered during any semester when student uses University facilities only. E

503 Business Conditions Analysis (3) Macroeconomic environment of firm. Determination of level of output, employment and prices for economy as whole. Implications of aggregate fluctuations for individual firm. Role of forecasting techniques and stabilization policies.

510 Fundamentals of Microeconomics (3) Theory of consumer behavior and demand, theory of production and cost, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available for students with credit for 511. Prereq: 311 or equivalent.

511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of supply and demand, theory of related experience, 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, development and role of Government.

513-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, non-market-clearing, monetarist, and rational expectations paradigms.

515 History of Economics (3) Purpose and methods of history of economics. Background for and origins, concerns, methods, development and conclusions of classi-
monetary theory and policy. Student participation. Pre-
req: 515.

561 Regional and Urban Location and Development Theory (3) Theory of industrial and agricultural loca-
tion and human migration. Economic basis for land-use pat-
terns, central place theory, urban form, spatial inequali-
ties and urban problems. National policies for regional and
urban assistance.

562 Methods of Regional and Urban Analysis (3) Theory of regional/urban economic structure and
determination, balance of payments adjustment, multi-
modal migration, commodity composition of trade, protectionist
arguments, and specializations are:

Education (College of Education)

MAJOR DEGREE
Education .................................................. Ph.D.

THE MASTER'S PROGRAM

The College of Education offers an extended
teacher preparation program which features a
professional year internship with accompanying
coursework. By completing the 24 hours asso-
ciated with the professional year, a student
could complete a Master's degree with 12 more
credits for the total of 36 semester hours. Course
requirements for the M.S. program include:

Fall Semester
  Internship .................................................. 4 hrs
  Specialty Studies ........................................... 6 hrs
  Analysis of Teaching for Professional Development .... 2 hrs

Spring Semester
  Internship .................................................. 8 hrs
  Clinical Studies ............................................. 4 hrs
  Post Internship
    Concentration Area .................................. 12 hrs
    TOTAL ..................................................... 36 hrs

Prior to the first semester of internship, a
student must be admitted to The Graduate
School. Prior to the completion of the first
semester of internship, a student must be
admitted to the Master's program in the College
of Education in which the degree is to be
pursued.

THE DOCTORAL PROGRAM

The Ph.D. program with a major in Education
provides six concentrations. The departments
participating in the Ph.D. program are Curricu-
lum and Instruction; Educational Leadership;
Educational and Counseling Psychology; Health,
Leisure, and Safety; Human Performance and
Sport Studies; Special Services Education;
and Technological and Adult Education.

The program requirements, concentrations and
specializations are:

Requirements Minimum Hours
Research Area ................................................. 14
Foreign or Computer Language (demonstrate proficiency) .......... 6
General Core Requirements
  Courses in history of education, philosophy of education (two areas
   must be represented) .................................... 4
  Courses in learning theory, curriculum theory, and administrative
   theory (three areas must be represented) ................. 6
  Trans-college seminar–three consecutive semesters (including
   summer) .................................................... 3
  Alternative Core Requirements
  Courses in philosophy of science .................................................. 3
  Trans-college Seminar–three consecutive semesters (including
   summer) .................................................... 3
  Seminar in area of specialization ............................................. 3
  Courses in learning theory/group or independent study ......... 3

Concentrations
Primary Concentration – A minimum of 16 hours normally selected from
one or two specializations within the primary concentration
Supporting Specialization – A minimum of 9 hours selected from a specialization
in a concentration other than the primary concentration

Cognate A minimum of 6 hours selected from
t outsider the college in addition to the
designated research courses ........................................... 6
Dissertation ................................................... 24

CONCENTRATIONS
Administrative Theory and Practice
  Specializations:
    1. School administration ............................................. 16
    2. Higher education administration ................................ 9
    3. Organizational leadership and policy studies .............

Theories of Curriculum Development and
Foundations of Education
Specializations:
  1. Anthropological, historical, philosophical, and sociological bases for educational planning
     and curriculum .............................................. 2
  2. Principles and models for planning, developing, and evaluating educational programs
  3. Research design for educational programs .......
Educational and Counseling Psychology

MAJORS

DEGREES

Guidance .................................................. M.S.

Education Psychology .................................... M.S., Ed.D.

Educational Psychology and Guidance .......................... Ed.S.

Education ................................................... Ph.D.

MAJORS

DEGREES

Guidance .................................................. M.S.

Education Psychology .................................... M.S., Ed.D.

Educational Psychology and Guidance .......................... Ed.S.

Education ................................................... Ph.D.

Professors:

Davis, K. L., Ed.D. ........................................ Georgia

DeFidder, Lawrence M. (Emeritus), Ph.D. ......................... Michigan

Dickinson, Donald J., Ed.D. .................................. Oklahoma State

Dietz, Siegfried C. (Emeritus), Ed.D. ............................... Arizona State

Hector, M. A., Ph.D. ......................................... Michigan State

Huck, Schuyler W., Ph.D. ........................................ Northwestern

McCallum, R. S., Ph.D. ......................................... Georgia

McClain, C. W. (Emeritus), Ph.D. ............................... Texas

Peterson, M. P., Ph.D. ......................................... Ohio State

Poppen, William A., Ph.D. ....................................... Ohio State

Thompson, C. L., Ph.D. ......................................... Ohio State

Williams, R. L., Ph.D. .......................................... Georgia Peabody

Associate Professors:

George, Thomas, Ed.D. ......................................... Tennessee

Kindall, Luther M., Ed.D. ....................................... Tennessee

Assistant Professors:

Harris, Shanette M., Ph.D. .................................... Virginia Tech

Hutchens, Teresa A., Ph.D. ........................................ Georgia

Nettles, Arie L., Ph.D. .......................................... Vanderbilt

The Department of Educational and Counseling Psychology offers graduate programs leading to the following: Master of Science with a major in Educational Psychology, concentrations in educational psychology and community counseling; Master of Science with a major in Guidance, concentrations in educational psychology and community counseling; and Doctor of Education with a major in Educational Psychology, concentrations in counselor education and educational psychology. The department also participates in the college-wide Ph.D. program with a major in Education. The concentration area is theories and practice of educational and personal adjustment with specializations in counselor education, counseling psychology, educational psychology, and school psychology.

Several programs in the department are accredited. The Ed.D. counselor education concentration and the Ph.D. specialization in counselor education are accredited by the Council for Accreditation of Counseling and Related Educational Programs; counseling psychology by the American Psychological Association; and school psychology by the National Association for School Psychology. Also, the school counseling and school psychology programs have the approval of the National Council for Accreditation of Teacher Education. The community counseling and school counseling programs are accredited by the Council for Accreditation of Counseling and Related Educational Programs. The program in Educational Psychology has been recognized as a "Designated Program" by the American Association of State Psychology Boards and the Council for the National Register of Health Service Providers in Psychology.

The application deadline for admission varies by program area. February 1 is the deadline for all programs. Some programs also review applications May 1, August 1, and November 1. For information about the various programs of study, write to the department admissions secretary.

THE MASTER'S PROGRAMS

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. Hour requirements for a major in Educational Psychology, concentration in educational psychology, 36; concentration in community counseling, 48; and for a major in Guidance, 48. The programs in community counseling and in guidance each require supervised practicum and internship experiences working with clients. A final examination is required of all Master's degree students.

THE EDUCATIONAL SPECIALIST PROGRAM

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

THE DOCTORAL PROGRAMS

The Ph.D. with a major in Education includes concentrations and specializations as listed under Education. For students applying to the Ph.D. program concentration located in this department, two applications are required: one for the Ph.D. in Education program and one for the department that specifies which specialization is desired (i.e. counseling psychology, counselor education, educational psychology, school psychology). Applicants for the Ed.D. with a concentration in either counselor education and practice of instructional improvement and assessment of student learning. The Ph.D. program in Education is limited to available to residents of the states of Georgia or South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

See College of Education for additional departmental listings.

GRADUATE COURSES

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 (1-4) Intensive teaching and teaching-related experiences in professional settings in public schools. Enrollment limited to postbaccalaureate students in professional year program. Prereq: Admission to Teacher Education program. May be repeated. Maximum 12 hrs. S/NC only. F, Sp

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 issue/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. Maximum 3 hrs. May not be used to meet 600 requirement. S/NC only.

Educational and Counseling Psychology

College of Education

MAJORS

DEGREES

Guidance .................................................. M.S.

Education Psychology .................................... M.S., Ed.D.

Educational Psychology and Guidance .......................... Ed.S.

Education ................................................... Ph.D.

R. Steve McCallum, Head

Professors:

Davis, K. L., Ed.D. ........................................ Georgia

DeFidder, Lawrence M. (Emeritus), Ph.D. ......................... Michigan

Dickinson, Donald J., Ed.D. .................................. Oklahoma State

Dietz, Siegfried C. (Emeritus), Ed.D. ............................... Arizona State

Hector, M. A., Ph.D. ......................................... Michigan State

Huck, Schuyler W., Ph.D. ........................................ Northwestern

McCallum, R. S., Ph.D. ......................................... Georgia

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Poppen, William A., Ph.D. ....................................... Ohio State

Thompson, C. L., Ph.D. ......................................... Ohio State

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Nettles, Arie L., Ph.D. .......................................... Vanderbilt

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Several programs in the department are accredited. The Ed.D. counselor education concentration and the Ph.D. specialization in counselor education are accredited by the Council for Accreditation of Counseling and Related Educational Programs; counseling psychology by the American Psychological Association; and school psychology by the National Association for School Psychology. Also, the school counseling and school psychology programs have the approval of the National Council for Accreditation of Teacher Education. The community counseling and school counseling programs are accredited by the Council for Accreditation of Counseling and Related Educational Programs. The program in Educational Psychology has been recognized as a "Designated Program" by the American Association of State Psychology Boards and the Council for the National Register of Health Service Providers in Psychology.

The application deadline for admission varies by program area. February 1 is the deadline for all programs. Some programs also review applications May 1, August 1, and November 1. For information about the various programs of study, write to the department admissions secretary.

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THE EDUCATIONAL SPECIALIST PROGRAM

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

THE DOCTORAL PROGRAMS

The Ph.D. with a major in Education includes concentrations and specializations as listed under Education. For students applying to the Ph.D. program concentration located in this department, two applications are required: one for the Ph.D. in Education program and one for the department that specifies which specialization is desired (i.e. counseling psychology, counselor education, educational psychology, school psychology). Applicants for the Ed.D. with a concentration in either counselor education and practice of instructional improvement and assessment of student learning. The Ph.D. program in Education is limited to available to residents of the states of Georgia or South Carolina. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

See College of Education for additional departmental listings.

GRADUATE COURSES

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 (1-4) Intensive teaching and teaching-related experiences in professional settings in public schools. Enrollment limited to postbaccalaureate students in professional year program. Prereq: Admission to Teacher Education program. May be repeated. Maximum 12 hrs. S/NC only. F, Sp

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 issue/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. Maximum 3 hrs. May not be used to meet 600 requirement. S/NC only.
460 Self-Management in the Helping Professions (3) Specialization: counseling psychology - 98; counselor education, Ph.D. - 98, Ed.D. - 79; educational psychology, Ph.D. - 92, Ed.D. - 89; school psychology, Ph.D. - 97. Residency for the Ph.D. program is three consecutive semesters of full-time coursework and two consecutive semesters for the Ed.D. The Ph.D. program requires coursework in both a supporting specialization and a cognate area, as well as either foreign language or computer proficiency. Coursework in statistics and research design is a requirement in all doctoral programs. Pre- dissertation research participation is a requirement in the Ph.D. program. The concentrations/specializations in counseling psychology, counselor education, and school psychology each require a year-long counseling practicum sequence and the equivalent of a year’s full-time work as an intern in an appropriate counseling setting. The concentrations/specializations in educational psychology and counselor education also require supervised practicum experience in classroom teaching. All doctoral students take written comprehensive examinations in the program concentration, supporting specialization and cognate areas. The guidelines for each program concentration may be consulted for further requirements.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

410 Sex Role Development: Implications for Education and Counseling (3) Theories and research concerning development of gender, sexual role, and its relevance in educational and counseling settings. F, Su

431 Personality and Mental Health (3) Various perspectives of mental health with application to education and other social settings. F, Su

432 The Disadvantaged Student: Psychoeducational Perspectives (3) Theory and research regarding etiology, psychosocial behavior and appropriate interventions. Sp

460 Self-Management in the Helping Professions (3) Applications of self-management strategies to career, social, emotional, and health domains for both helping professionals and their clientele. Preq: Introductory course in psychology or consent of instructor. S/NC or letter grade. Sp, Su

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

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

502 Registration for Use of Facilities (3-5) Required for the student to be 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 (1-3) May be repeated. Maximum 12 hrs. S/NC only. E

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

510 Psychological Theories of Human Development Applied to Education (3) Theory and research on emotional, social, and intellectual development. Developmental over life span with applications to educational and therapeutic settings. F, Su

511 Cognitive Development: Implications for Education (3) Prerequisites: Admission to program, 431, 525, 551 and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. 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 social development. E

516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning, attribution and information processing as systems apply to education. Preq: 515 or consent of instructor. F

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

520 Statistics and Research Design: Conceptual (3) Consumer-oriented, conceptual treatment of statistics, research design, and quantitative basis of testing. E

521 Statistics and Research Design: Application (3) Data collection and analysis. Descriptive techniques, estimation, logic of hypothesis testing and selected parametric and non-parametric measures. F, Su

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. S/NC only. Sp

541 Psychoeducational Assessment (3) Direct, psychometric and naturalistic assessment methods in learning environments. Preq: Admission to school psychology program or consent of instructor, and 550 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 other 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 consultation skills to educational settings. Coreq: 545. Sp

549 Internship in School Psychology (1-6) Supervised experience as school psychologist in departmentally approved site. Prereq: 548 or equivalent. May be repeated. Maximum 18 hrs. S/NC only. E

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

551 Theory and Practice of Counseling (3) Philosophical bases of helping relationship; 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, Su

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

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

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

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

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

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

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

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

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

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

600 Doctoral Dissertation (3-15) P/NC 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 department on topics of interest. May be repeated. Maximum 15 hrs. S/NC or letter grade. E

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

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

649 Advanced Internship in School Psychology (1-9) Supervised experience as school psychologist in departmentally-approved internship site for doctoral level students. Preq: Enrollment in doctoral level school psychology program and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E
650 Seminar in Counselor Education (1) Professional issues related to role and function of counselor educator. Prereq: Admission to doctoral program in counselor education. May be repeated. Maximum 2 hrs. S/NC only. E

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 Counselor Education (1-6) Supervised employment in departmentally approved internship sites. May be repeated. Maximum 12 hrs. S/NC only. E

660 Seminar in Educational Psychology (1) Major professional issues, role and scope of educational psychology as field of study and practice. Prereq: Admission to doctoral program in educational psychology. May be repeated. Maximum 2 hrs. S/NC only. F

661 Education Implications of Neuropsychology (3) Theory and assessment. Common syndromes and their behavioral and cognitive manifestations. Prereq: 516; and 541 or equivalent individual assessment course; or consent of instructor. Sp


663 Scale Construction (3) Development, pilot testing, and revision of attitude inventories, rating scales, and other paper-and-pencil techniques for assessing beliefs, personality characteristics, and opinion. Prereq: 525, and two-course sequence in statistical analysis. A

664 Cognitive Interventions with Psychoeducational Problems (3) Cognitive approaches applied to coping skills, self instruction, cognitive restructuring, symbolic and social modeling and belief systems. 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

666 Practicum in Instructional Planning (3) Development and management of course or program of instruction in educational psychology. Prereq: 665, or consent of instructor. F

669 Internship in Educational Psychology (1-6) Supervised employment in departmentally approved educational psychology internship sites. May be repeated. Maximum 12 hrs. S/NC only. E


671 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in assessment of clients. Prereq: 525, 552 or consent of instructor. 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 consent of instructor. May be repeated. Maximum 6 hrs. E

678 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling. Prereq: 655, or 674, or consent of instructor. S/NC only. E

679 Internship in Counseling Psychology (1-6) Supervised employment in departmentally approved counseling psychology internship sites. Prereq: Admission to counseling psychology doctoral program and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

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

Educational Leadership

(College of Education)

MAJORS

EDGREES

College Student Personnel ........................................ M.S.
Educational Administration and Supervision .................. M.S., Ed.S., Ed.D.

Education ............................................................ Ph.D.

Mary Jane Connelly, Head

Professors:

Coffield, William H. (Emeritus), Ph.D. ..................... Iowa
Harris, G. W., Jr., Ph.D. .......................................... Michigan
Lovell, J. T. (Emeritus), Ed.D. .................. Florida
McInnis, Malcolm C., Jr., Ph.D. .................. Florida State
Peccolo, C. M. (Emeritus), Ph.D. ..................... Iowa
Petitbone, Timothy J. ....................... New Mexico State
Roney, Robert K., Ed.D. ........................................ Tennessee
Stollar, Dewey H. (Emeritus), Ph.D. ..................... Ohio State
Trusty, Francis M. (Emeritus), Ed.D. ........... Stanford
Ubbenhoff, Gerald C., Ph.D. ........................................ Minnesota
Venditti, Fred P. (Emeritus), Ed.D. ..................... Northern Colorado

Associate Professors:

Askew, Jerry W. (Adjunct), Ph.D. ..................... Ohio State
Connelly, Mary Jane, Ed.D. .............. Michigan
Groff, Francis M. (Adjunct), Ed.D. ............. Tennessee
Harris, G. W., Jr., Ph.D. ..................... New Mexico State
Husen, Peter M., Ed.D. .......................................... Illinois
Mertz, Norma T., Ed.D. .......................................... Columbia

Assistant Professor:

Grubb, James J., M.S. ........................................ Indiana State

For additional information, contact the department head.

ADMISSION REQUIREMENTS

General test of the Graduate Record Examination: writing sample if GRE verbal is below 50th percentile; leadership potential judged by activities in organizations; and rating forms or letters of recommendation. The Ed.D. applicant must also interview with all faculty members on campus or elsewhere. Application deadlines are February 1, July 1, and October 1.

THE MASTER'S PROGRAM IN EDUCATIONAL ADMINISTRATION AND SUPERVISION

Thesis Option

A minimum of 33 credit hours including 6 hours of Thesis 500 is required. A major consists of a minimum of 18 hours. An internship is highly recommended but not required. A final oral examination is required with a written exam at the option of the committee.

Non-Thesis Option

A minimum of 36 credit hours is required with a minimum of 18 hours in the major. An internship is highly recommended but not required. A final written comprehensive examination is required with an oral exam at the option of the committee.

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. The courses are prerequisites to other courses in the department.

THE MASTER'S PROGRAM IN COLLEGE STUDENT PERSONNEL

This program is designed for individuals interested in entering the field of student personnel administration in colleges and universities and in community or junior colleges. The program has both a thesis and non-thesis option. A minimum of 36 hours, which includes 6 hours of practicum experience, is required in either option.

THE EDUCATIONAL SPECIALIST PROGRAM

Thesis Option

A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 518 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the thesis.

Non-Thesis Option

A minimum of 60 hours beyond the baccalaureate degree including 6 hours of Educational Administration and Supervision 503 is required. Six hours must be in a cognate area within the college and 6 hours outside the college. An internship is highly recommended but not required. A written comprehensive examination is given as well as an oral exam over the problem papers.
THE DOCTORAL PROGRAM

For the Ed.D. program, the minimum hours are determined by the student's doctoral committee. Six to eight hours must be in a cognate area with at least 12 hours outside the college unless the student has a Master's degree in a field outside the College of Education. Two consecutive semesters of 604 must be taken during residency. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as well as an oral exam over the dissertation.

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

Educational Administration and Supervision

GRADUATE COURSES

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

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

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

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

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

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

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

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

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

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

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

548 Introductory Supervision and Personnel (3) Basic supervisory and personnel concepts and related competencies; building (or micro-organizational) level; interviewing, personnel planning, collecting and maintaining data, supervising both individual and non-instructional personnel, clinical supervision, staff evaluation and staff development. Prereq: Introduction M.S. core or consent of instructor. Sp, Su

553 Strategies of Educational Planning (3) Processes for improving decision-making function through use of both quantitative and qualitative planning techniques. Prereq: In Ed DMin, Ed SMin, or consent of instructor. Prereq: M.S. Introductory M.S. core or consent of instructor. F, Su

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

560 Internship in Educational Administration (3) Field experience in appropriate educational setting working directly with administrator. At end of planned program of study. Placement by department assignment. Some on-campus classes in conjunction with 561 or 562. Prereq: 21 hrs in educational administration and supervision or consent of instructor. E

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

583 Educational Leadership--Principalship (3) Knowledge, skills and relationships for principal to be effective instructional leader. Stimulation materials and field-based activities. Culminating course with internship and problems paper. At end of planned program of study. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F, Su

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

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

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

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

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

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

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

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

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

611 Current Issues in Educational Administration (1-3) Current topics for practicing school administrators, selected each semester and presented by specialist. Prereq: Presently school supervisor or administrator, or consent of instructor. May be repeated. S/NC or letter grade. E

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

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

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

622 Programs for the Professional Preparation of Educational Administrators and Supervisors. F, Sp

623 Exploring designs and methodology for training school administrators at both pre-service and in-service levels. F

626 Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school systems and higher educational institutions. Interdisciplinary disciplines of community participation, special interest groups, based on literature and research from education, sociology, and political science. F, Sp

627 Introduction to Institutional Research (3) Contemporary educational administration and supervision and their influence upon education, nation and citizens. Organization, structure and processes of the school system: student, teacher, school, community, public served. Prereq: 544 or consent of instructor. F

644 Educational Finance and Business Management (3) Contemporary educational finance policy and practice and their implications for public school systems. F

660 Administration of Complex Organizations (3) Contemporary educational finance policy and practice and their implications for public school systems and higher educational institutions. F

661 Field Problems in Educational Administration (3) Equipment and professional preparation of school administrators. F

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

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

692 Field Problems in Educational Administration (3) Equipment and professional preparation of school administrators. F
Higher Education

GRADUATE COURSES

455 Seminar in Student Leadership (1) Knowledge and skills in leadership roles for resident assistants, student government leaders, student activities, and other student organizations. Topics to be assigned. May be repeated. E

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

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

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

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

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

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

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

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

596 The Community-Junior College (3) History and role of two-year college, major functions, organization and administration, problems and issues. Sp

599 Independent Study (3) Prereq: Consent of supervisory instructor. May be repeated. S/NC or letter grade. E

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

619 Administration and Governance of Higher Education (3) Trends, structure and process of collegiate governance. Development of understanding of administrative and organizational structure, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su

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

698 Seminar in Higher Education (3) Analysis of administrative and organizational structure, theory and practice in management of American colleges and universities. Prereq: 543 or consent of instructor. Su

Electrical and Computer Engineering

(College of Engineering)

MAJOR DEGREES

Electrical Engineering .......................... M.S., Ph.D.

Joseph M. Googe, Head

Professors:

Alekoff, Igor, Ph.D. .................................. Wisconsin
Bailey, J. Milton, Ph.D. ................................. Georgia Tech
Birdwell, J. Douglas, Ph.D. ......................... MIT
Bishop, Asa O., Jr., Ph.D. ............................ Clemson
Blalock, T. Vaughn, Ph.D. ............................ Tennessee
Bodenheimer, Robert E., Ph.D. ................. Northwestern
Bose, Bimal K. (Condra Chair of Excellence), Ph.D. ................... Calcutta
Bouldin, Donald W., Ph.D. ....................... Vanderbilt
Cunningham, James W. (UTSI), Ph.D. ............ Tennessee
Gonzalez, Rafael C. (Distinguished Prof.), Ph.D. ................. Florida
Googe, Joseph M., Ph.D. , Ph.D. .............. Georgia Tech
Green, Walter L., Ph.D. .............................. Texas A&M
Hoffman, Graham W., Ph.D. ..................... Harvard
Hung, James C. (Distinguished Prof.), PE, Ph.D. .............. New York
Kennedy, Eldredge J., Ph.D., Ph.D. ............. Tennessee
Lawler, Jack S., Ph.D. ............................... Michigan State
Leffell, Will O. (Emeritus), M.S. ................. Tennessee
Neff, Herbert P., Ph.D. .............................. Auburn
Pace, Marshall O., Ph.D., Ph.D. ............... Georgia Tech
Pierce, J. Frank (Distinguished Prof.) (Emeritus), PE, Ph.D. ......... Pittsburgh
Rochelle, Robert W. (Emeritus), Ph.D. ............................. Maryland
Roth, J. Reece, Ph.D. .............................. Cornell
Symonds, Frederick W., Ph.D. ................. Nottingham
Tillman, James D. (Emeritus), Ph.D. ............. Auburn
Weaver, Charles H. (Emeritus), PE, Ph.D. ................. Wisconsin

Associate Professors:

Bomar, Bruce W. (UTSI), Ph.D. ............... Tennessee
Joseph, Roy D. (UTSI), Ph.D. .................. Case Western
Rosenberg, David, Ph.D. ......................... New York
Rochelle, James M., Ph.D. ....................... Tennessee
Trivedi, Mohan M., Ph.D. .......................... Utah State
Wallar, J. Wayne, Ph.D. ............................. Tennessee

Assistant Professor:

Abidi, M. A., Ph.D. ............................... Tennessee
Brzakovic, Dragana, Ph.D. ..................... Florida
Crilly, Paul B., Ph.D. .............................. New Mexico State
Koch, Daniel, Ph.D. ............................... Missouri (Rolla)
Smith, L. Montgomery (UTSI), Ph.D. ................. Tennessee

Lecturers:

Adams, Raymond K., M.S., P.E. ............... Tennessee
Martin, Clyde D., Jr., M.S. .......................... Tennessee

The Electrical and Computer Engineering Department has a graduate committee to administer, promote, and advance the general well-being of the graduate program. The Department of Electrical and Computer Engineering and the Department of Nuclear Engineering jointly offer a Master's degree program in the field of fusion energy. Students may have the opportunity to do their Master's thesis at the Fusion Energy Division of the Oak Ridge National Laboratory or at the Plasma Science laboratory, affiliated with the Electrical and Computer Engineering Department. A limited number of Graduate Research Assistantships are available at each location. Further information about this program is available from the department.

THE MASTER'S PROGRAM

Graduate work leading to the Master of Science degree in Electrical Engineering may be completed during one academic year of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, which may obtain the Master's degree in one calendar year.

Admission Requirements

Students applying for admission to the Master of Science program and who hold a B.S. in Electrical Engineering are considered for admission on an individual basis. The minimum expectation is an undergraduate cumulative grade-point average of 3.0 out of 4.0 and a GPA of 3.0 for the senior year. A TOEFL score of 580 is required for international students. Students who hold the B.S. or B.A. in a field other than electrical engineering are also expected to have a minimum cumulative grade-point average of 3.0 and a minimum senior year average of 3.0 in that field. These students should also have a background equivalent to that obtained by earning credit with a minimum 3.0 grade-point average in the Electrical Engineering courses normally taken at the 200 and 300 levels in the Bachelor's program in this department, and two senior electrical and computer engineering courses (and any labs associated with them) in the student's area of interest. Students from fields other than electrical engineering who have met the admission standards except for this background will be admitted only as non-degree students until they have completed coursework to provide this background.

Master's Degree Requirements

Specific degree requirements which must be met include:

1. Electrical and Computer Engineering 503 and 504.

2. Six semester hours of graduate credit in mathematics consisting of mathematics courses of 400 level or higher which have been approved by the E.C.E. Graduate Committee.

3. An additional 12 semester hours of 500-level work in electrical and computer engineering or 6 semester hours of 500-level work in one area of electrical and computer engineering courses and 6 semester hours of 500-level work in another area approved by the
THE DOCTORAL PROGRAM

The Ph.D. with a major in Electrical Engineering may be taken in either the concentration in circuit theory, computers, electronics, communication theory, electromagnetic theory, plasma engineering, power systems, solid-state electronics, and control systems. A student is required to complete the following:

1. A Master of Science in Electrical Engineering or an equivalent course, and the background coursework beyond the B.S. excluding thesis, dissertation, and dissertation credit.
   a. A minimum of 24 semester hours of core coursework at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level coursework.
   c. A minimum of 12 hours of mathematics courses approved by the Electrical and Computer Engineering Graduate Committee.
   d. At least 3 semester hours of this work must be in an area other than the student's major area.

2. A minimum of 12 hours of graduate coursework approved by the Electrical and Computer Engineering Graduate Committee at the 500 and 600 levels.

3. One foreign language if the student's faculty committee feels this is crucial to the student's research efforts.

4. Satisfactory performance on both a qualifying and comprehensive examination.

   a. The qualifying examination is prepared by the student's departmental faculty and consists of a 3-hour written examination in each of four areas: (1) mathematics and transform methods, (2) basic electrical network analysis, (3) computer control and including analog signal processing electronics, and (4) modern control theory. The qualifying examination is normally taken after the completion of 24 hours of graduate coursework, or immediately after completion of a Master's degree. The comprehensive examination is normally taken at least six months after the qualifying examination. Part of the comprehensive examination will be a defense of a formal written dissertation proposal. The comprehensive examination must be passed and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D.

   b. Participation in departmental seminars.

   c. A minimum of 24 hours of doctoral dissertation.

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

   e. Departmental actions regarding a graduate student may be reported as ready for admission to candidacy, first to the Department Graduate Committee and then to the Department Faculty.

GRADUATE COURSES

COURSES REQUIRED IN THE ELECTRICAL AND COMPUTER ENGINEERING GRADUATE CURRICULUM CANNOT BE USED IN EITHER THE M.S. OR PH.D. PROGRAM. THE FOLLOWING COURSES MAY BE USED TOWARD A GRADUATE DEGREE IN ELECTRICAL AND COMPUTER ENGINEERING EXCEPT WHEN REQUIRED BY THE PROGRAM.

405 Digital Signal Processing and Filter Design (3) Discrete-time signals and systems, sampling, discrete Fourier transforms, analog filter characteristics, non-recursive and recursive filter design, and CAD tools for filter design. Includes laboratory experiments and projects.


412 Linear Control System Design (3) Classical and modern techniques for design and compensation of linear feedback control systems. Prerequisites: Linear System Analysis.

413 Passive and Active Network Synthesis (3) Review of network analysis techniques, passive network driving point synthesis, transfer function synthesis, approximation theory, topics in active network synthesis. Prerequisite: 312.

421 Electric Energy Systems (3) Structure and operation of power systems, hydroelectric power, steam plant operation; planning, control; reliability. Balanced and unbalanced faults; system protection; system stability. Prerequisite: Electric Energy System Components.

422 Machines (4) Dynamic behavior of rotating machines; transfer functions for common modes of operation of d.c. machines; response to different waveforms in supply; determining equations for a.c. machines and their numerical solutions. Includes laboratory experiments and projects. Prerequisite: Electric Energy System Components.

423 Power Electronics (4) Principles and characteristics of power semiconductor devices, single-phase and polyphase phase-controlled converters, converter control, ac phase controller, voltage-fed inverter and diode converter principles, industry applications. Includes laboratory experiments and projects. Prerequisite: Electric Energy System Components.

424 Power Electronics Circuits (3) Voltage-fed inverters, PWM principles, control of inverters, ac-dc converters, dc-motor drives, resonance converters, motor drives, brushless dc machine principles. Prerequisite: 423.

425 Direct Electrical Energy Conversion (3) Principles and practices of energy conversion devices and interfacing them to loads. Photovoltaics, thermoelectric, MHD, and fuel cells. Prerequisite: Electric Energy System Components, Electronic Devices.

431 Digital and Analog Integrated Electronics (4) Basic processing and fabrication of active and passive components for digital integrated circuits. Characteristics of bipolar, MOS and JFET transistors in typical analog and digital integrated circuit designs; standard digital logic: TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; design concepts for op-amps, comparators, references, regulators, and other linear functions. Includes laboratory experiments and projects. Prerequisite: Electronic Circuits.

432 Analog Signal Processing Electronics (4) Transversal filter characteristics and design; sampled data and all-pass integrated circuits; operational amplifiers, systems and applications; active filters, phase and delay systems; operational amplifiers and their applications. Includes laboratory experiments and projects. Prerequisites: Electronic Circuits.

433 Electronic Amplifiers (4) Feedback amplifier principles; wideband linear amplifier design, radio frequency and audinated power amplifier design; transistorized power supply design; oscillator principles. Includes laboratory experiments and projects. Prerequisite: Electronic Circuits.

441 Communication Systems II (3) Probability, random variables, and random processes as applied to communication systems. Analog modulation in presence of noise. Digital communication concepts: binary and M-ary signaling, synchronization, multiuser detection, multiple access, spread spectrum, line, coding theory, error correction and detection. Includes laboratory experiments and projects. Prerequisite: Communication Systems I.

442 Antennas and Propagation (3) Linear antennas, arrays, other simple antennas. Antenna gain, impedance, communication link parameters. Wave propagation in earth bound free space, earth's troposphere and ionosphere. Reflections from earth; effects on link reliability. Prerequisite: Fields and Waves.

443 Microwave Circuits and Electronics (3) Scattered wave description of circuits; isolators and amplifiers, couplers and power dividers, circulators, phase shifters. Linear and nonlinear properties of interconnects and switching, amplification and modulation by switching, filtering and multiplexing devices. Transmission line and waveguide components. Includes laboratory experiments and projects. Prerequisite: Fields and Waves.


451 Microprocessors in Computer Engineering (4) Project-oriented course using microcomputer kit having monitor program and development system with cross-assemblers, file management, and emulation capability. Interfacing and hardware/software trade-offs in interrupt driven applications. Term grade dependent on number of projects completed, homework solutions, and engineering notebook. Includes laboratory experiments and projects. Prerequisite: Introduction to Logic Design of Digital Systems.

452 Organization and Design of Digital Systems and Computer Architecture (4) Introduction to organization and design of computer and digital systems. ALU and CPU structures, control unit organization, storage systems, and memory management. Microprocessor and different interrupt structures. Includes laboratory experiments and projects. Prerequisite: Introduction to Logic Design of Digital Systems.

453 Data Acquisition Systems (4) Digital-to-analog conversion techniques; Quad and R-2R ladder networks; error analysis of D/A converters; sample hold circuits; analog-to-digital conversion techniques; open loop systems; direct and matrix converters; closed loop systems; dual slope and successive approximation; error analysis of A/D converters; accuracy, linearity; noise and shielding; automated testing of A/D and D/A converters; device service routines; signature analysis. Includes laboratory experiments and projects. Prerequisite: Introduction to Logic Design of Digital Systems and Electronic Circuits.

with plasma arcs, and related topics. Prereq: 565 or consent of instructor.

571 Pattern Recognition (3) Decision-theoretic and structural approaches to pattern recognition. Deterministic and statistical decision rules, feature extraction and representation, syntactic and semantic methods. Prereq: 471 or consent of instructor.


573 Vision and Sensing for Robotics and Automation I (3) Acquisition, processing, integration, and interpretation of a wide range of vision and non-vision sensing modalities as applied to autonomous and teleoperated robotic systems. Prereq: Consent of instructor.

574 Vision and Sensing for Robotics and Automation II (3) Aspects of robot programming and motion using various sensing modalities. Selected topics from current literature. Prereq: Consent of instructor.


589 Measurement Science I (3) (Same as Nuclear Engineering 588, Chemical Engineering 588, Civil Engineering 589, Engineering Science and Mechanics 588, Mechanical Engineering 588, and Aerospace Engineering 588.)

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

598 Graduate Seminar (1) Topics of interest discussed in current literature. May be repeated. Maximum 6 hrs. S/NC or letter grade.

599 Special Topics I (3) May be repeated. Maximum 9 hrs.

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


612 Advanced Systems Theory (3) Game theory, dual control problem, hierarchical systems, and information structures. Prereq: 611.


615 Analysis of Nonlinear Networks and Systems (3) Systematic stabilization of nonlinear electric circuits. Network elements and equation, linear systems, nonlinear O.D.E.'s, geometric analysis and numerical techniques. Prereq: Consent of instructor.

616 Active Network Synthesis (3) Theory and design of active analog filters and practical RC realizations. Prereq: Consent of instructor.

617 Special Topics in Systems Theory I (3) Topics of current interest to students and faculty: large scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 503 and consent of instructor.

618 Special Topics in Systems Theory II (3) Topics of current interest to students and faculty: large scale systems, model order reduction, algebraic and geometric system theories, and advanced design methods. Prereq: 617.

621 Modern Techniques for Electric Energy Systems I (3) Analysis of electric energy systems. Prereq: Consent of instructor.


631 Advanced Topics in Electronic Instrumentation I (3) Based on particular interests of students. Fundamental physical processes in instrumentation transducers: thermal, magnetoelectric, electromechanical and quantum-mechanical devices. Prereq: 531-32 and consent of instructor.

632 Advanced Topics in Electronic Instrumentation II (3) Physics of modern discrete, monolithic, hybrid and hybrid electronic structures and their application in signal processors, Resolution, sensitivity, response time, and noise considerations in signal processors used in modern electrical instrumentation. Prereq: 631.

641 Electromagnetic Diffraction and Scattering (3) Diffraction of electromagnetic waves by spheres, corners and cylinders; ground wave propagation; modern approximate methods; creeping waves, leaky waves. Prereq: Consent of instructor.

642 Asymptotic Techniques in Wave Propagation (3) Electromagnetic waves with spatial and temporal dispersion and with fluctuation. Geometric theory of diffraction for electromagnetic waves, supported by results from asymptotic approximations of geometrical optics and physical optics. Field and power flux scattering. Large scale radiative transport in tenuous particulate media, multiple scattering theory; coherence and mode-spread. Fluctuation due to turbulence; rough surface scattering. Prereq: Consent of instructor.

643 Advanced Topics in Information Science I (3) Detection theory, coding theory, system identification, communication signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection; suboptimal detection. Prereq: 504 or consent of instructor.

644 Advanced Topics in Information Science II (3) Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding algorithms, source codes, identification schemes, deterministic and stochastic, and hierarchical methods. Prereq: 643.

645 Advanced Topics in Microwave Networks (3) Multisport scattering and transfer representations. Narrow and wide band synthesis of networks containing lumped and distributed components, interstage matching and response equalization. Low noise, low distortion and high power designs of amplifiers and oscillators. Prereq: Consent of instructor.

646 Advanced Topics in Microwave Networks (3) Reciprocal and nonreciprocal devices, directional devices, high frequency switches and multiplexers, optimization in distortion control. Network analyzer measurement techniques and integration of measured data with design procedures. Prereq: Consent of instructor.

651 Computer-Aided Design of VLSI Systems I (3) Fabrication of microelectronic devices: computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-2 or consent of instructor.

652 Computer-Aided Design of VLSI Systems II (3) Computer-aided design tools; design and implementation of fully custom very large scale integrated (VLSI) circuit design: testability; testing of fabricated chips. Prereq: 651.

663 Advanced Plasma Physics I (3) Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic descriptions of plasma, plasma transp-
Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, computational mechanics, biomedical engineering, and optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant is advised as to any prerequisite courses before entering a program; the student’s program of study must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student’s major professor may be selected from a department other than the Department of Engineering Science and Mechanics; however, at least one member of the student’s graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics.

A departmental application is required in addition to The Graduate School application. The names and addresses of four references must be included with the departmental application.

The flexibility and interdisciplinary aspect of the programs are designed to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The department’s course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as biomechanics.

THE MASTER’S PROGRAM

Two M.S. options are offered: option I requires a thesis, while option II does not. The second plan is restricted to those students who have had significant engineering professional work experience.

In option I, a minimum of 30 semester hours including the thesis is required. In option II, a minimum of 33 hours is required. The requirements include the following:

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<tr>
<th>Hours</th>
<th>Credit</th>
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<tr>
<td>Mathematics Engineering courses* (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)</td>
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<td>6</td>
<td>6</td>
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<tr>
<td>Thesis</td>
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Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)

A final examination is required under both options covering graduate coursework and the thesis.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Master’s degree. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

4. Attendance and participation in graduate seminars and colloquia.

5. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

6. After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master’s degree or completed 24 semester hours of graduate credit. The purposes of qualifying examinations are:

   a. To determine the qualifications of the student to continue the Ph.D. program,
   b. To identify the areas of strengths and weaknesses to guide the student’s graduate coursework and research.

7. A final examination on the student’s dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville without residency requirements. The Ph.D. program in Engineering Science is available to residents of the state of Florida. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE CREDIT FOR 400-LEVEL COURSES

Four hundred-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of minimum required credit hours in a Master’s degree program must be at or above the 500 level.

GRADUATE COURSES

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; tensile, shear, and flexural properties. Prereq: 321, Materials Science and Engineering 201, 3 hrs or 2 hrs and 1 lab.

423 Fracture-Safe Design (3) Critical review of variables controlling fracture toughness; part and flaw geometry; characterization of fracture toughness by stress intensity factors, strain energy release rates, J integral, COD data, transition temperature tests; use of fracture toughness data in design. Prereq: 321 and Materials Science and Engineering 201. (Same as Materials Science and Engineering 475) 3 hrs or 2 hrs and 1 lab.

425 Principles of Nondestructive Testing (Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic emission, and radiographic methods. Laboratory. Prereq: 321, Materials Science and Engineering 201. 3 hrs or 2 hrs and 1 lab.

431 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parameter systems; energy methods; free vibration of continuous bodies. Prereq: 321, Mathematics 231.

433 Dynamic Systems (3) Three dimensional dynamics of particles and rigid bodies; variable mass systems; central force motion; Lagrange’s equations; stability; transfer functions. Prereq: Dynamics.

435 Engineering Acoustics (3) Concepts of acoustics, measures of sound and their units, noise generation and transmission, noise control principles and application, materials and procedures for noise abatement. Prereq: Introductory course in vibrations oroustics.

442 Fluid Mechanics II (3) Differential forms of basic laws; compressibility, laminar and turbulent flow, shocks, duct flows with heat transfer and friction; open channel flow, critical flow, energy methods; internal and external viscous flows; boundary layers, elementary turbulent boundary layer models. Prereq: 341, Mathematics 321.

461 Experimental Stress Analysis (3) Theory, techniques, and instrumentation of resistance strain gauges; theory and techniques of brittle coating methods; introduction to other strain measuring devices. Prereq: 321, Electrical and Computer Engineering 301, 2 hrs and 1 lab.

463 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moire' method, interferometry, and holography. Prereq: 321, Physics 322, 2 hrs and 1 lab.

465 Dynamic Data Acquisition (2) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis, transfer function analysis, digital signal processing, transduction, experimental pa

535 Energy Methods in Applied Mechanics (3) Virtual work, minimum potential energy, and complementary energy. Castigliano’s theorem; Hamilton’s principle; Lagrangian and Hamiltonian methods. Examples from structures, plates and shells, buckling, vibrations, dynamics and fluid mechanics.

536 Advanced Engineering Acoustics (3) Introduction to the application of acoustic analysis: vibration of continuous systems, plane and spherical waves, transmission phenomenon, radiation and scattering. Basic methods of absorption and transmission mechanisms, microphones, ultrasonic, sonar transducers. Prereq: 431 or 435.

539 Continuum Mechanics (3) Cartesian tensors, stress and strain, fundamentals of continuum mechanics concepts; stress, strain, deformation, constitutive equations. Conservation laws for mass, momentum, energy. Applications in solid and fluid mechanics.

541 Fluid Dynamics I (3) Kinematic, kinematic and thermodynamic properties of fluids. Development of rate of deformation laws; mass, momentum and energy conservation relationships; non-dimensionalization. Applications of Euler and Navier-Stokes equations: exact solutions, potential flow, transonic, boundary layer approximations; coreq: coreq: 539.

542 Fluid Dynamics II (3) Development of basic concepts and governing equations for turbulence and turbulent flow conditions. For departmental thesis students only. May be repeated. S/NC only. E


557 Computational Mechanics Seminar I (1) Current developments in computational fluid/thermal/structural mechanics. For departmental thesis students only. May be repeated.

560 Computational Mechanics Laboratory I (1) Intro- duction to networked computer/engineering work station environment for computer graphics/engineering numerical analysis. Prereq: 551.

561 Photoelasticity (3) Polarized light; basic principles of photoelasticity; experimental techniques and equip- ment; numerical methods in photoelasticity; applications. Prereq: Mathematics 431, 2 hrs and 1 lab.

565 Optical Engineering I (4) Wave optics; scalar diffraction theory, introduction to Fourier optics; ray or geometric optics; polarization; paraxial design methods; introduction to aberrations.

567 Optical Engineering Laboratory I (3) Laboratory in support of Optical Engineering I (566); Prereq or coreq: 566.

568 Optical Engineering II (4) Statistical optics; sporo- taneous and induced emission: black and grey body radiation; incoherent, partial and totally coherent radia- tion, mutual coherence function; detectors; radiometry. Prereq: 566.

569 Optical Engineering Laboratory II (2) Prereq: 567, Coreq: 568.


576 Applied Artificial Intelligence (3) (Same as Nu- clear Engineering 576.)

577 Expert Systems in Engineering (3) (Same as Nuclear Engineering 576.)

581 Special Topics in Engineering Mechanics (3) Problems related to recent developments and practice. Open to juniors or seniors. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

585 Thesis (1) (1) P/NP only. E

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

589 Measurement Science II (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engi- neering 588, Electrical and Computer Engineering 588, Aerospace Engineering 589, and Mechanical Engineer- ing 589.)

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

621 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory for arbitrary shell geometry; selected applications of theory in structural engineering. Prereq: 525 or Civil Engineer- ing 562.


624 Viscoelasticity (3) Viscoelastic constitutive rela- tions; isothermal boundary value problems; wave propa- gation in viscoelastic materials; stability problems; deter- mination of viscoelastic properties. Prereq: 523 and 539 or Polymer Engineering 541.

625 Theory of Plasticity (3) Yield conditions; strain hardening; general constitutive equations; plastic poten- tial; uniqueness theorems; extremum and variational principles. Problems in perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Applica- tions. Prereq: 523.


641 Advanced Topics in Fluid Mechanics and Convection Heat Transfer (3) Convective momentum, heat and mass transfer: boundary layer analysis, stability, transition, turbulence, closure models; Navier-Stokes equations; closure procedures; time- and ensemble-averaging, large-scale structures, high-speed flow, reattachment, nonreacting, excitation, ionization. Applications in propulsion, lasers, aerodynamics. Prereq: 542.

645 Theory of Turbulence (3) Mathematical descriptions of turbulence: isotropic turbulence, energy spectra, Kolmogoroff's hypothesis, large and small eddy structure for turbulent flows; turbulent diffusion by continuous movement; applications to turbulent jets, wakes, pipe flow, and boundary layers. Prereq: 542. (Same as Aerospace Engineering 645.)

651-52 Advanced Topics in Computational Fluid Dynamics (3.3) Approximation theory; analysis of accuracy, convergence, and stability for smooth and non-smooth solutions; shocks, artificial dissipation, two- and three-dimensional, compressible viscous and inviscid flows; potential, Euler and complete Navier-Stokes des-criptions; mixed subsonic-supersonic flows. Algorithm concepts: finite difference, finite element, approximate factorization, flux vector splitting, finite volume, generalized coordinate and adaptive grids; steady flows including second-order turbulence closure. Thin layer and parabolic Navier-Stokes equations; multi-dimensional, turbulent and reacting flows. Computer project. Project: Prereq: 552.

653-54 Advanced Topics in Computational Solid Mechanics (3.3) Fracture mechanics; singularity solutions; non-linear constitutive problems, variable stiffness, initial strain and initial stress methods, plasticity, creep, unified creep-plasticity theory; geometrically non-linear problems, large deflection, stability; shell structures; analysis of accuracy, convergence, adaptive grids. Prereq: 553.

657 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.)

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.

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**English (College of Liberal Arts)**

**MAJOR**

**DEGREES**

M.A., Ph.D.

Dorothy M. Scura, Head

**Professors:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Degree</th>
<th>University/Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bratton, Edward W.</td>
<td>Ph.D.</td>
<td>Illinois</td>
</tr>
<tr>
<td>Carroll, D. Allen</td>
<td>Ph.D.</td>
<td>North Carolina</td>
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<tr>
<td>Cox, Don R., Ph.D.</td>
<td></td>
<td>Missouri</td>
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<tr>
<td>Drake, Robert Y., Jr.</td>
<td>Ph.D.</td>
<td>Yale</td>
</tr>
<tr>
<td>Dykeman, Wilma</td>
<td>Adjunct</td>
<td>Northwestern</td>
</tr>
<tr>
<td>Enos, Allison R., Ph.D.</td>
<td></td>
<td>Indiana</td>
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<tr>
<td>Finneran, Richard J.</td>
<td>Ph.D.</td>
<td>North Carolina</td>
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<tr>
<td>Fitzgerald, Mary</td>
<td>Adjunct</td>
<td>Princeton</td>
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<tr>
<td>Goslee, Nancy M., Ph.D.</td>
<td></td>
<td>Cambridge</td>
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<tr>
<td>Hefnerman, Thomas J.</td>
<td>Ph.D.</td>
<td>Cambridge</td>
</tr>
<tr>
<td>Kelly, Richard M. (Lindsay Young Prof.)</td>
<td>Ph.D.</td>
<td>Columbia</td>
</tr>
<tr>
<td>Leggett, B. J.</td>
<td>(Distinguished Prof.)</td>
<td>Florida</td>
</tr>
</tbody>
</table>

- Lofaro, Michael A., Ph.D. .................. Maryland
- Maland, Charles J., Ph.D. ................... Michigan
- Miller, R. Baxter, Ph.D. .................... Brown
- Penner, A. Richard, Ph.D. ................... Colorado
- Reese, Jack E., Ph.D. ........................ Kentucky
- Sanders, Norman J. (Lindsay Young Prof.) | Ph.D. | North Carolina         |
- Scara, Dorothy M., Ph.D. ................... North Carolina
- Shurr, William (Distinguished Prof.)      | Ph.D.| North Carolina         |
- Trahen, Joseph B., Jr., Ph.D. ............. Princeton
- Wheeler, Thomas V., Ph.D. ................... North Carolina
- White, John M. (Lindsay Young Prof.).     | M.A. | Cambridge              |

**Associate Professors:**

- Dumas, Bethany K., Ph.D. .................... Arkansas
- Garner, Stanton B., Jr., Ph.D. ............. Gill, J. E., Ph.D. .... North Carolina
- Goslee, David F., Ph.D. ..................... Yale
- Hutchinson, George, Ph.D. ................. Indiana
- Kaller, Marilyn, Ph.D. ..................... Rutgers
- Keene, Michael, Ph.D. ...................... Texas
- Leki, Ilona, Ph.D. .......................... Illinois
- Robinson, Frank K., Ph.D. ................. Pennsylvania
- Stillman, Robert, Ph.D. .................... North Carolina
- Thomas, Joyce Carol, M.A. ................... Stanford

**Assistant Professors:**

- Atwill, Janet, Ph.D. ......................... Purdue
- Barton, Kerri, Ph.D. ............................ Texas Christian
- Bensel-Myers, Linda D., Ph.D. ............ Oregon
- Dunn, Allen, Ph.D. ........................... Washington
- Hammontree, Patsy G., M.A. ............... Tennessee
- Hirst, Russel, Ph.D. .......................... Renesselaer
- Howes, Laura L., Ph.D. ..................... Columbia
- Hubbard, Dolan, Ph.D. ...................... Illinois
- Jennings, La Vinia, Ph.D. .................. North Carolina
- Papke, Mary E., Ph.D. ...................... McGill
- Smith, Arthur, Ph.D. ....................... Houston
- Wallace, Ray, D.A. ......................... Illinois State
- Zomock, John, Ph.D. ......................... Columbia

**The Department of English offers the Master of Arts and the Doctor of Philosophy degrees with a major in English. Thesis and non-thesis options are available for the M.A. as well as a special concentration in writing.**

- Detailed information about the Master's and doctoral programs, and about individual graduate courses, may be obtained by writing the Director of Graduate Studies in English, 306 McClung Tower.

**THE MASTER'S PROGRAM**

**Requirements**

- **Coursework:** A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 500-600 level (Only 3 hours of 593 Independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.

- **Thesis Option:** Written under the direction of a faculty member of the department and approved by a committee of two other faculty members. Six semester hours of credit will be given.

- **Non-Thesis Option:** Six hours of additional courses at the 500-600 level, making a total of 30 hours of required coursework.

**Language Requirement:** Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:

1. Completion of the second year of a language at college level with a grade of C or better.
2. Completion of French 302 or German 332 at UT Knoxville with a grade of B or better.
3. Passing of the regular Ph.D. foreign language examination as currently administered at UT Knoxville.
4. Passing the Graduate Student Foreign Language Test (GSFLT) as currently administered through the English Department.

**Final Examination:** A candidate presenting a thesis or a creative project must pass a ninety-minute oral examination, consisting of a short thesis defense, but chiefly of questions covering the general history of English and American literature, not merely the coursework taken. A reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English.

**Residence Requirement:** There is no residence requirement for the M.A., but students should attempt to pursue a full-time program whenever possible.

**WRITING CONCENTRATION**

The Master's program with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry.

**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 51 semester hours beyond the B.A. to include at least 21 semester hours at the 600 level; at least 15 semester hours at the 500 level or above (only 3 hours of 593 Independent Study may be applied toward the M.A. and 3 after the M.A.); a special three-hour course in teaching composition; and 12 additional hours at any level, including the 400 level. Up to 6 of these additional hours may be taken in some cognate field or fields such as history, philosophy, French. These courses must be drawn from those approved for graduate credit. All other coursework must be in the English department. In this coursework, students must normally maintain a 3.5 GPA.

Dissertation: Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. The research and dissertation will be directed by a faculty member of the department and approved by a doctoral committee of three or four other faculty members.

Language Requirement: A language requirement met in one of the following ways:

1. Two languages approved by the Director of Graduate Studies in English. The requirement for each language may be fulfilled by (a) completion of French 302 or German 332 with a grade of B or better; (b) completion at UT Knoxville of any two courses on the 300 level or above in the foreign language or literature with at least a grade of B in each course; (c) passing of the regular Ph.D. foreign language examination as currently administered at UT Knoxville; or (d) passing the Graduate Student Foreign Language Test (GSFLT) as currently administered through the English Department.

2. One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade on the language examination given by UT Knoxville and completion of two courses given in the foreign language at the 400 level or above, at least one course to be at the 500 or 600 level, with at least a grade of B in each course.

3. One modern language approved by the Director of Graduate Studies in English and intensive study of the English language. This requirement must be fulfilled by completion of (a), (b), or (c) in option 1, for one foreign language; and completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509 History of the English Language (offered in alternate years only). For the other 3 hours, the student may either complete the history of the language sequence or choose one other course in language taught in the Department of English at the 500 or 509 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. However, anyone electing this language option may not take the comprehensive examination in linguistics.

Examinations: (1) A 4-hour qualifying examination taken before the end of the first year. The Ph.D. 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 the foreign languages before beginning the first part of the examination.

Dissertation Defense: A one-hour examination on the dissertation and other related areas.

Residence Requirement: Two consecutive semesters as a full-time student. For students not on teaching assistantships, full-time consists of at least 6 hours of coursework and/or dissertation hours each semester. For students on assistantships, full-time consists of at least 6 hours of courses and/or dissertation hours and 3 hours of teaching each semester.

GRADUATE COURSES

401 Medieval Literature (3) Reading and analysis of selected medieval literary masterpieces in modern English.

402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Criseyde in Middle English.

404 Shakespeare I: Early Plays (3) Shakespeare's dramatic achievement before 1601. Reading and discussion of selected plays from romantic comedies, including Twelfth Night; English histories, including Henry IV; and early tragedy, including Hamlet.

405 Shakespeare II: Later Plays (3) Shakespeare's dramatic achievement between 1601 and 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure; and dramatic romances, including The Tempest.

406 Renaissance Drama (3) English theatre between 1590 and 1640 through reading of representative plays by Shakespeare's contemporaries: Marlowe, Webster, Donne.

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.


412 British Drama from 1660 to 1800 (3) Playwrights from Dryden and Wycherly to Goethe and Sheridan; formal developments: heroic play, cynical comedy, affective tragedy, and experiential drama.

413 The Eighteenth-Century British Novel (3) Defoe to Austen.

414 Romantic Poetry and Prose I (3) Wordsworth; Coleridge, and Blake; readings from Lamb, De Quincey, and other prose writers.

415 Romantic Poetry and Prose II (3) Keats, Shelley and Byron; readings from Hazlitt, Peacock, and other prose writers.

416 Victorian Poetry and Prose I (3) Tennyson, Pre-Raphaelites, Carlyle, Newman, and Mill.

419 Victorian Poetry and Prose II (3) Browning, Arnold, Hopkins, Hardy, Ruskin, Darwin, and Wilde.

420 The Nineteenth-Century British Novel (3) Scott to Hardy.

421 Modern British Novel (3) Lawrence, Joyce, and Woolf.

422 Women Writers in England (3) Literary consciousness and works of British women writers in nineteenth and twentieth centuries. (Same as Women's Studies 575.)

431 Colonial, Federal, and Early National American Literature (3) From Columbus to Washington Irving.

432 American Romanticism and Transcendentalism (3)

433 American Realism and Naturalism (3)

434 Modern American Literature (3) World War I to present.

435 American Novel before 1900 (3) From earliest sentimental novels through Broderick and Cooper, and major figures to 1900: Hawthorne, Melville, Stowe, Clemens, and James.


441 Southern Literature (3) Southern writing from colonial science and literature; frontier humorists, local color writers, and Southern literary renaissance.

442 American Humor (3) Early nineteenth century into twentieth century: Mark Twain.

443 Topics in Black Literature (3) Contents vary: particular genres, authors, or theologies. May include: Langston Hughes and Harlem Renaissance, Richard Wright and Gwendolyn Brooks, writing by Black women, African-American literature in English, and Black American autobiography.

451 Modern British and American Poetry (3) From Yeats and Frost to Auden, Stevens, and more recent poets.

452 Modern British and American Drama (3) One of the student's works as precursors to modern dramatists: Williams, Miller, Albee, and representatives of Black theater, Bullins and Baraka.

453 Continental Drama (3) Selection of plays in English translation by major European writers from late Renaissance to present; twentieth-century achievement.

454 Twentieth-Century International Novel (3) Joyce, Camus, Kafka, Nabokov.

455 Persuasive Writing (3) Persuasive strategies in both student and professional writing. Practice in mastering effective logical and emotional appeals.

460 Technical Editing (3) Editing technical material for publication. Principles of style, format, graphics, layout, and document management. Prereq: 456 and 459, or consent of instructor.

461 Advanced Technical and Professional Writing (3) For students planning careers in industry, education, and government who need technical writing skills. Writing of definitions, process descriptions, sets of instruc- tions, descriptions of mechanisms, recommendation re- ports, abstracts, proposals, and major reports. Prereq: Junior standing in student's major or consent of instruc- tor.


463 Advanced Poetry Writing (3) Further development of skills acquired in basic writing poetry course. Prereq: 350 and consent of instructor.

464 Advanced Fiction Writing (3) Further development of skills acquired in basic writing fiction course. Prereq: 350 or consent of instructor.

471 Sociolinguistics (3) Study of language in relation to society. Empirical and theoretical focus. Large-scale units: tribes, nations, social groups. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 471 and Sociolinguistics 471.)

472 American English (3) Phonological, morphological, and syntactic characteristics of major social and regional varieties of American English: origins, functions, and implications for cultural pluralism. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Lin- guistics 472.)

474 Teaching English as a Second or Foreign Lan- guage (3) Grammatical structures of English: particular
grammatical difficulties of non-native learners of English.

547 Teaching English as a Second or Foreign Language II (3) Second language acquisition theory: Issues in teaching four language skills to learners of English. Materials and methods of language teaching and testing: preparation of materials. Observations of and team teaching with experienced staff member. Prereq. English 474. (Same as Linguistics 475.)


481 Studies in Folklore (3) Topics vary. May be repeated with different topic. Maximum 6 hrs.

482 Major Authors (3) Content varies. Concentrated study of at least one of most influential writers in British or American literary history: e.g., Donne, Tennyson, Jane Austen, Whitman, Faulkner, Baldwin or Lawrence.

483 Special Topics in Literature (3) Topics vary. May be repeated. Maximum 6 hrs.

484 Special Topics in Writing (3) Original writing integrating research into works directly taught by professor. 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 cinematic movements, or other topics. May be repeated with consent of department. Maximum 6 hrs. (Same as Cinema Studies 489.)

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.

505 Teaching Freshman Composition (3) Introduction to teaching Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching associates.

506 Introduction to Literary Research (3) Critical examination of aims of English studies, profession of English teacher, theory of literature, and methods of research: collecting, evaluating, analyzing of material, and transmitting of results of scholarship.

507 Applied Criticism: The Rhetoric of Literary Forms (3) Study and application of ways in which major critics have analyzed poetry and prose fiction.

508 History of the English Language I (3) Historical, morphological, and syntactic development of the 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 development 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 Medieval England.

520-21 Readings and Analysis in Selected Areas of Sixteenth- and Seventeenth-Century Prose, Poetry, and Drama (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.

530-31 Readings in English Literature of the Restoration and Eighteenth Century (3,3) Topics vary: genre, poetry, prose, fiction, drama; or period: Restoration, earlier eighteenth century, later eighteenth century.

540-41 Readings in English Literature of the Nineteenth Century I and II (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.
Environmental Engineering

See Civil Engineering

Environmental Practice

(College of Veterinary Medicine)

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<td>D.V.M.</td>
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<td>L. N. D. Potgieter, Head</td>
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Professors:
- Farkas, W. R., Ph.D. .......... Duke
- Oliver, J. W., D.V.M., Ph.D. ..... Purdue
- Potgieter, L. N. D., Ph.D. ......... Iowa State
- Reed, C. F. (Emeritus), D.V.M. .... Ohio State

Associate Professors:
- Lohrrot, C. D., D.V.M., Ph.D. ...... Tennessee
- New, J. C., D.V.M. ............. Texas A&M
- Rohrbach, B. W., V.M.D. .......... Johns Hopkins
- Schroeder, E. G., D.V.M. ......... Michigan State
- Schultz, T. W., Ph.D. .......... Tennessee

Assistant Professors:
- Frazier, D., D.V.M., Ph.D. .......... NC State
- Orosz, S. E., D.V.M., Ph.D. ...... Ohio State

Clinical Associate:
- Farnar, P. L., D.V.M. .......... Missouri

Post-Doctoral Research Associate:
- Alanari, H. M., Ph.D. .......... Kansas State
- Chumley, P. R., D.V.M. ........ Ohio State
- Kelitch, W. J., D.V.M. .......... Michigan State
- Mishu, L. D., V.M. ............ Texas A&M

See Veterinary Medicine for program description.

DEGREES

Environmental Practice

(Major in Veterinary Medicine)

MAJOR | DEGREE
-------------------|-------------------
Veterinary Medicine | D.V.M.

PROFESSIONAL

Admission Requirements

For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate School and must have completed (1) general botany or biology, 6 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 9 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

GRADUATE COURSES

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

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

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of plant pathogenic fungi. Prereq: 313 or consent of instructor. 2 hrs and 2 labs. F,A

511 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, causal agents and control measures. Prereq: 510 or consent of instructor, 1 hr and 2 labs. Su,A

512 Soil-Borne Plant Diseases (3) Causal agents, host-parasite-soil environment interactions, epidemiology, and control of soil-borne plant diseases. Prereq: 313. 2 hrs and 1 lab. F,A

515 Physiology of Plant Disease (3) Biochemical and physiological events involved in host-pathogen interactions, mechanisms of disease resistance. Prereq: Introductory plant physiology and pathology, or consent of instructor.

520 Plant Parasitic Nematodes (4) Morphology, physiology, taxonomy, ecology, and management of plant parasitic nematodes, host-parasite relationships. Prereq: 6 hrs biological science or consent of instructor. 2 hrs and 2 labs. Sp,A

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infection; structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and spiroplasmas. Prereq: 313 or consent of instructor. 2 hrs and 1 lab. Sp,A

523 Field Crop and Vegetable Insects (2) Identification, biology and management of insects affecting commercial vegetable and home garden crops. Prereq: 321 or basic entomology course. 1 hr and 1 lab. Sp,A

525 Medical and Veterinary Entomology (3) Morphology, taxonomy, biology and control of arthropod pests and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: 321 or 325, or Zoology 380, or consent of instructor. 2 hrs and 1 lab. Sp,A

530 Integrated Pest Management (3) Principles and application of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest populations below economic threshold levels. Prereq: 321, or consent of instructor. (Same as Plant and Soil Science 530) F,A

531 Special Problems in Entomology (1-3) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. E

532 Special Problems in Plant Pathology (1-4) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. F,Sp

533 Concentrated Study in Entomology (1-3) Selected subjects in entomology for advanced students, concentrated in time and subject matter. Prereq: 321 or basic entomology course. May be repeated. Maximum 6 hrs. F,Sp

541 Seminar (1) Review of literature and current research in entomology and plant pathology. May be repeated. Maximum 2 hrs. E

551 Medical and Veterinary Entomology (3) Morphology, taxonomy, biology, and control of arthropod pests and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: 321 or 325, or Zoology 380, or consent of instructor. 2 hrs and 1 lab. Sp,A

553 Special Problems in Entomology (1-3) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. E

554 Special Problems in Plant Pathology (1-4) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. F,Sp

Finance

(College of Business Administration)

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

Harold A. Black, Head

Professors:
- Black, Harold A., Ph.D. .......... Ohio State
- Dotterweich, William W. (Emeritus), Ph.D. ..... Pennsylvania
- Frazier, D., D.V.M., Ph.D. ...... Johns Hopkins
- G. C. (Distinguished Prof.), Ph.D. .... New York
- Shrieves, Ronald E., Ph.D. ........ UCLA
- Wansley, James. W. (Stokely Scholar), Ph.D. .......... South Carolina

Associate Professors:
- Auxier, A. L., Ph.D. .......... Iowa State
- Boehm, T. P., Ph.D. ......... Washington (St. Louis)
- Enhardt, M. C., Ph.D. .......... Georgia Tech
- Wachowicz, J. M., Jr., CPA, Ph.D. .......... Illinois

Assistant Professors:
- Collins, M. Cary, Ph.D. .......... Georgia
- Daves, Phillip R., Ph.D. ......... North Carolina
- Debnam, R. P., Ph.D. .......... Ohio State
- Guth, Deborah L., Ph.D. ........ Florida
- Kinzly, Scott A. (Visiting), Ph.D. .... SUNY-Buffalo
BUSINESS ADMINISTRATION

CONCENTRATIONS

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

MBA Concentration: Finance.
The curriculum offers courses for those interested in careers in corporate financial management, security analysis and investments, banking and financial institutions, and real estate.

Minimum course requirements are three courses: Finance 521, plus two courses from the following: 511, 512, 522, 531, 532, 581, or 582. A fourth finance course of the student's choice is strongly advised. Courses selected must be approved by the Finance Department MBA advisor.

Ph.D. Concentration: Finance.
Minimum course requirements are finance seminars 641, 642, 651, 652.

GRADUATE COURSES


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

511 Contemporary Issues in Corporate Finance (3) Selected topics in corporate finance, recent developments that have significant impact on strategic issues in financial management. Capital budgeting, financial and ownership structure, dividend policy and corporate growth and control. Prereq: 501.

512 Problems in Financial Management (3) Readings and cases that apply finance theory to real world investment, financing, and asset management problems. Prereq: 501.


599 Special Topics in Finance (1-3) Topics vary. Prereq: 501 or consent of instructor. May be repeated. Maximum 6 hrs.

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


642 Seminar in Finance II: Theory of the Firm (3) Financial theory of firm and financial decision making under conditions of uncertainty, equilibrium models of firm. Option pricing, agency theory, capital structure, economics of information, and dividend policy.

651 Advanced Seminar in Finance I (3) Recent theoretical and empirical developments in micro-finance literature. Topics vary. May be repeated. Maximum 6 hrs.

652 Advanced Seminar in Finance II (3) Recent theoretical and empirical developments in macro-finance literature. Topics vary. May be repeated. Maximum 6 hrs.

Food Technology and Science

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREES

Food Technology and Science: M.S., Ph.D.

Hugh O. Jaynes, Head

Professors:

Collins, J. L., Ph.D. .................................. Maryland
Davidson, P. M., Ph.D. ................................ Washington State
Draughn, F. A., Ph.D. ................................. Georgia
Jaynes, H. O., Ph.D. ................................. Illinois
Melton, S. L., Ph.D. ................................. Tennessee
Mount, J. R., Ph.D. ................................. Wisconsin
Overcast, W. W. (Emeritus), Ph.D. ....... Iowa State
Penfield, M. P., Ph.D. .............................. Tennessee

Associate Professors:

Christen, G. E., Ph.D. .............................. Missouri
Loveland, H. D., Ph.D. ............................ Kansas State
Mount, J. R., Ph.D. ................................. Ohio State
Riemann, M. J., Ph.D. ............................. Kansas State

Assistant Professor:

Biswal, R. N., Ph.D. .............................. Massachusetts

The Department of Food Technology and Science offers the Master of Science and Doctor of Philosophy degrees. Students in the doctoral program may choose research in the concentration area of food products, food chemistry, food microbiology, or sensory evaluation of foods. Commodity interests (meats, dairy, fruits, vegetables, bakery products) can be emphasized in any of the areas by careful selection of courses and the research topic. Minors are available in cognate fields. For detailed information, contact the department head.

Graduate School rating forms of letters of recommendation from three people are required. Respondents should be familiar with the applicant's scholastic ability and professional potential.

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 research plan. Registration for 6 hours of 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. 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. 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.

2. All students are required to take 2 hours of 500 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. 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. Scores on the GRE aptitude test are also required.


3. A minimum of 72 hours beyond the Bachelor's degree, excluding credit for the Master's thesis, is required. Of this, 24 semester hours must be 500 Doctoral Research and Dissertation. At least 6 of the 24 hours must be courses numbered above 600.

4. At least 24 hours of coursework numbered above 500 are required exclusive of doctoral research and dissertation. At least 6 of the 24 hours must be courses numbered above 600.

5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Technology and Science.
GRADUATE COURSES

410 Food Chemistry I (3) Reactions of proteins, enzymes, and additives in foods. Physicochemical interactions of food materials. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. F

411 Food Chemistry II (3) Reactions of inorganic compounds, carbohydrates, lipids and vitamins in foods. Prereq: Chemistry 110 or equivalent. 2 hrs and 1 lab. Sp.

420 Food Microbiology (2) Physical, chemical and environmental factors moderating growth and survival of foodborne microorganisms, pathogenic and spoilage microorganisms affecting quality of foods and their control. Prereq: Microbiology 210. Coreq: 429. F


430 Sensory Evaluation of Food (3) Principles and methods of sensory evaluation of foods. Prereq: Basic statistics. 2 hrs and 1 lab. F


451 Dairy Products II (3) Science and technology of processing dairy products. Chemical, physical, and microbiological changes that occur during manufacture. Prereq: Principles of Chemistry, Introduction to Organic and Biochemistry, General Microbiology. 2 hrs and 1 lab. F

460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, flaked and formed products. Effect of processing methods on product characteristics. Prereq: 360 or consent of instructor. 3 hrs and 1 lab. F

470 Food Crop Products (3) Food products from plants. Types, manufacturing systems, quality attributes and utility. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp.

480 Cereal Science and Bakery Products (3) Chemistry and technology of processing cereal grains, interactions of ingredients during production and storage of baked products. Prereq: 410 or 411 or equivalent. 2 hrs and 1 lab. F, A

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

501 Seminar (1) Individual reports and discussion on topics from current literature. May be repeated. Maximum 3 hrs. 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 Problems in Lieu of Thesis (2-3) May be repeated. S/Nc only. E

510 Instrumental Analysis of Food (3) Modern instrumental methods for control of food manufacturing processes. Prereq: 410-11. 2 hrs and 1 lab. F

511 Color and Flavor of Foods (3) Chemical basis, measurement of the reactions involved in color and flavor changes in foods. Manufacture and application of materials used to modify color and flavor. Prereq: 410-11. 2 hrs and 1 lab. F

520 Food and Industrial Fermentations (3) Microbiology, biochemistry and technology of food-related fermentations involving dairy products, meat, cereals, fruits and vegetables. Production of food ingredients and by-product utilization. Prereq: 420-29, 440. Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp.

521 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and relationship to food processing. Isolation of microorganisms from foods and equipment. Prereq: 420-29, 1 hr and 2 labs. Sp.

540 Food Product Development (3) Art, science and technology of developing and marketing new food products. Prereq: 440; 2 hrs and 1 lab. Sp.

560 Advanced Meat Science (3) Physical and chemical changes that occur in conversion of muscle to meat; effect of postmortem treatments on meat quality, composition and palatability; packaging, preservation and quality control. Prereq: 460; 2 hrs and 1 lab. Sp.

580 Oilseed Products (3) Chemistry and technology of foods and food ingredients produced from oilseeds. Prereq: 410-11 or equivalent. 2 hrs and 1 lab. Sp.

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 discussion on research topics from current literature. May be repeated. Maximum 3 hrs. F, Sp.

620 Food Toxicology (2) Basic and applied concepts in food toxicology; toxicological aspects of processed foods. Mode of action, prevention and control of food toxicants in food supply. Prereq: 410-11, S/Nc, or consent of instructor. Sp.

640 Advanced Food Processing (3) Role of processing treatments in modification of food properties; techniques in food processing. Prereq: 440, 510, 511 or consent of instructor. Sp.

Forestry, Wildlife and Fisheries

(College of Agricultural Sciences and Natural Resources)

MAJORS

DEGREES

Forestry ........................................... M.S.

Wildlife and Fisheries Science ................. M.S.

George T. Weaver, Head

Professors:

Barrett, J. W. (Emeritus), Ph.D. .............. Syracuse
Buckner, E. R., Ph.D. ......................... NC State
Corn, H. A. (Emeritus), Ph.D. ............... Syracuse
Dimmick, R. W., Ph.D. ....................... Wyoming
Forber, D. C. (Adjunct), Ph.D. .............. Florida
Little, R. L., Ph.D. ............................. NC State
McCabe, C. E. (Adjunct), D.F. ............... Duke
Ostermiller, D. M., Ph.D. ................... Syracuse
Peiton, M. R., Ph.D. ......................... Georgia
Rigley, T. H. (Adjunct), Ph.D. ............... VPI
Schneider, G., Ph.D. ......................... Michigan State
Sharp, J. B., D.P.A. ......................... Harvard
Smith, G. (Adjunct), Ph.D. ................. Tennessee
Strange, R. J., Ph.D. ......................... Oregon State
Stuttmann, D. A., Ph.D. ..................... Minnesota
Thor, E. (Emeritus), Ph.D. ................. NC State
Weaver, G. T., Ph.D. ......................... Tennessee

Wilson, J. L., Ph.D. ............................ Tennessee
Woods, F. W. (Emeritus), Ph.D. .......... Tennessee

Associate Professors:

Dearden, B. L., Ph.D. ............................ Colorado State
Hay, R. L., Ph.D. ............................... Duke
Hopper, G. M., Ph.D. ......................... VPI
Nodvin, S. C. (Adjunct), Ph.D. ............. Cornell
Rennie, J. C., Ph.D. .............................. NC State
Schnaar, S. E., Ph.D. ........................... Colorado State
Smith, K. G. (Adjunct), Ph.D. ............ Utah State
Smith, W. P. (Adjunct), Ph.D. .............. Oregon State
Wells, G. R., D.F. ............................. Duke
Winstetter, P. M., Ph.D. ..................... Iowa State

Assistant Professor:

King, M. M., Ph.D. ............................... Utah State

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science is offered by the Department of Forestry, Wildlife, and Fisheries. The Master of Business Administration, with a concentration in forest industries management, is available for qualified students. This degree program is offered by the College of Business Administration with participation by the Department of Forestry, Wildlife, and Fisheries. The Doctor of Philosophy with a specialization in forest biology, wildlife science, or fisheries science can be achieved through the University's intercollegiate graduate program in Ecology.

THE MASTER'S PROGRAMS

Both thesis and non-thesis options are available for the major in Forestry: a thesis is required in Wildlife and Fisheries Science. For admission, the student must have a Bachelor's degree from an accredited institution in forestry, wildlife, fisheries, or other natural resource area. Applicants must also have taken the general Graduate Record Examination (GRE). Graduate School ratings forms or letters of recommendation from three individuals familiar with the applicant's academic ability are required. The department also has an application that must be submitted at the time of application to The Graduate School.

Thesis Option

1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for 6 hours of Thesis (Forestry 500 or Wildlife and Fisheries Science 500) is required.

2. A graduate committee of no fewer than 3 faculty members must be selected by the second semester of residence. At least one member shall be from outside the department. In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student's committee and no more than 10 hours of the minimum 30 can be below the 500 level. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to include Forestry 512 or Wildlife and Fisheries 512, Seminar, in their programs. This is required of each graduate student in residence fall semester.
GRADUATE COURSES

422 Forest and Wildland Resource Policy (3) Policy formulation; criteria for policy determination; forest and wildland law and regulation; theory of conflict resolution; formal and informal resolution. Prereq: Senior standing. F

423 Forest Recreation Planning and Management (3) Planning processes, master and site planning, site design projects; management strategies, methods of visitor and recreation site management; case studies. Week-end field trips. Prereq: 321, 323, Ornamental Horticulture and Landscape Design 280, or consent of instructor. 2 hrs and 1 lab. Sp

431 Solid Wood Processing (3) Production processes for solid wood products: sawing, secondary machining, drying and preservation. Prereq: 331 and 332, or consent of instructor. 2 hrs and 1 lab. Sp

432 Wood Composites and Gluing (3) Principles of adhesion; wood adhesives; fundamentals of plywood and composite panel manufacture. Evaluation resin properties; bonding strength and durability. Prereq: 351 and 352, or consent of instructor. 2 hrs and 1 lab. F

434 Measurement and Marketing of Wood Products (3) Measurement systems used for sale and transfer of wood products. Application of market principles and analysis to wood products markets and economic structure of wood products industry. Prereq: 431, 433 and Forestry, Wildlife and Fisheries 313, or consent of instructor. Sp

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

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

511 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resource management. Identifies, analyzes and prepares written report. Topic and report must have approval of graduate committee. Available only to students in non-thesis option for M.S. in Forestry. E

512 Seminar (1) Current developments in forestry. Registration is open to all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/NC only. F

520 Advanced Forest Tree Biology (3) Growth, reproduction, and physiology of trees; forest ecology; variability and taxonomy of forest trees. Prereq: Standing in forestry or biological science, or consent of instructor. Sp,A

530 Advanced Forest Resource Management (3) Analysis of forest management problems as exemplified in public agencies and private firms. Forest organization and computerized regulation systems; financial and operational models, tools, as applied to forest resource management. Prereq: Senior-level forest management or consent of instructor. Sp,A

540 Genetics in Forestry (3) Genetic improvement of forest trees. Prereq: Genetics, population ecology, seedling establishment, and management of superior phenotypes; field testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytology and tissue culture; use of biotechnical evaluation; 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 contemporary alternatives. Overnight field trips. Prereq: Senior-level forest recreation or consent of instructor. F,A

555 Forest Recreation Research Methods (3) Evaluation of research methodologies through readings and case studies; techniques of research resource monitoring and research design; current research trends in wildland recreation. Prereq: 321 or equivalent and statistics. F,A

560 Industrial Forestry I (3) Economic structure of forest products industry; analysis of industry structure and markets, domestic and foreign. Current trends in markets and industrial structure; impacts on short-term planning. Prereq: Senior-level forest management or consent of instructor. F,A

565 Industrial Forestry II (3) Evaluation of alternative strategies for firms in industry. Role of timber and timberland in integrated firm from standpoint of financial and strategic evaluations for different levels of self-sufficiency. Prereq: 560 or consent of instructor. Sp,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: 575 or consent of administration and policy or consent of instructor. F,A

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analysis of silviculture: silvicultural principles involved and tools used, prescribed fire, pesticides, in regeneration and management; computer modeling of stand dynamics, structure, growth/yield. Prereq: Undergraduate silviculture course or consent of instructor. 2 hrs and 1 lab. Sp,A

581 Cytogenetics (3) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory: normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: 382 and at least 6 additional hrs in biological sciences. (Same as Botany 581.) Sp,A

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory, fixed and variable plot sampling, list sampling, random sampling, regression estimators; multistage and multiphase sampling. Growth and yield predictors for even-aged and uneven-aged forests. Prereq: 326 or consent of instructor. Sp,A

590 Advanced Topics in Forestry (1-3) Recent advances and concepts; research techniques and analysis of current problems. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

593 Independent Study in Forestry (1-4) May be repeated. Maximum 6 hrs. E
547 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. S, A.

560 Advanced Topics in Wildlife and Fisheries Science (3) Recent advances and concepts, research techniques and analysis of current problems. Prereq: 443, 444, 445, or consent of instructor. May be repeated. Maximum 6 hrs. E

593 Independent Study in Wildlife and Fisheries Science (1-6) May be repeated. Maximum 6 hrs. E

French
See Romance Languages

Geography
(College of Liberal Arts)

MAJOR DEGREES

Geography ................. M.S., Ph.D.

Sidney R. Jumper, Head

Professors:

Aiken, Charles S., Ph.D......... Georgia
Bell, Thomas L., Ph.D.......... Iowa
Hammond, E. H. (Emeritus), Ph.D........... California
Jumper, Sidney R., Ph.D.......... Tennessee
Long, G. (Emeritus), Ph.D........ Northwestern
Minkel, C. W., Ph.D........ Syracus
Paludan, C. T. (UTSI), Ph.D........ Denver
Ralston, B., Ph.D........ Northwestern
Schmude, T. H., Ph.D.......... Wisconsin
Wilbanks, T. J. (Adjunct), Ph.D........ Syracus

Associate Professors:

Blasing, T. J. (Adjunct), Ph.D........... Wisconsin
Brinkman, L. W., Jr., Ph.D............. Wisconsin
Brown, Marilyn (Adjunct), Ph.D........ Ohio State
Foresta, R., Ph.D........ Rutgers
Pulsipher, L. Ph.D........ Southern Illinois
Reid, J., B. Ph.D........ Louisiana State

Assistant Professors:

Harden, Carol P., Ph.D........ Colorado
Horn, Sally P., Ph.D........ California

The department offers the Master of Science and Doctor of Philosophy degrees. The Master's degree emphasizes development of professional competence as a geographer and offers opportunities to gain substantial depth in a concentration or a major technique. An emphasis in geographic information systems is available for students who have appropriate backgrounds in mathematics and computer science. The doctoral program is for those who have demonstrated proficiency in conducting independent research. The department is particularly well-qualified to direct research in geography of the natural environment (biogeography, biological conservation, geomorphology), spatial analysis (especially transportation and location analysis), Latin America, and the American South. Graduate concentrations include nonmetropolitan areas, land use, urban geography, transportation geography, geography of resources, geography of development, and regional and historical geography of the United States.

THE MASTER'S PROGRAM

The department offers the thesis and non-thesis options for the Master of Science. Both options require a minimum of 30 semester hours beyond the completion of a sound undergraduate major program. At least two-thirds of the 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 501, 515, 590, 12 hours of 600-level seminars, and (at each offering during residency) 501. A minimum of 12 hours must be earned in related fields outside the department. Competence in cartography and quantitative techniques is required. Additional tools, including languages, will be required as appropriate to the student's areas of research specialization. Examinations required for admission to candidacy include a written comprehensive; written examinations on two special fields; and an oral examination on the student's program, the special fields, and the dissertation proposal. Also required is a final oral examination on the dissertation and on other aspects of the program as determined by the student's doctoral committee.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

411 Computer Mapping and Geographic Information Systems (3) Concepts, management, and presentation of digital data for spatial analysis; cartographic data structures. Prereq: 310 and knowledge of computer language or consent of instructor. 2 hrs and 1 2-hr lab.

412 Cartography (3) Cartographic techniques applied to design, compilation, and reproduction of maps and other graphics. Prereq: 310 or consent of instructor. 2 hrs and 1 2-hr lab.

413 Remote Sensing: Types and Applications (3) Principles and uses of remote sensing imagery, digital data, and spectral data; geographic interpretation and mapping techniques. Prereq: 310 or consent of instructor.

415 Quantitative Methods in Geography (3) Geographical application of statistical techniques, point pattern analysis, and analysis of time and place. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk cultures and customs, material culture and rural settlement, examples from eastern North America and selected foreign areas. Prereq: 101-02 or 320 or consent of instructor.

425 Historical Geography of the United States (3) Survey of changing human geography of United States during four centuries of settlement and development. Changes in landscape and development of agricultural regions, and patterns of urban-industrial development. Prereq: 361 or consent of instructor.

433 The Land-Surface System (3) Characteristics of surface form, water, vegetation, and surface materials, and their regional interrelationships. People as evaluators and agents of change. Prereq: Geography of the Natural Environment or consent of instructor.

434 Climatology (3) General circulation system leading to world climate patterns. Climatic change and modification, and interrelationships of climate and human activity. Prereq: Geography of the Natural Environment or Meteorology or consent of instructor.

435 Biogeography (3) Changing distribution patterns of plants and animals on variety of spatial and temporal scales. Effects of continental drift, Pleistocene climatic changes, and human activity on world biota. Prereq: Geography of natural environment or consent of instructor.

436 Water Resources (3) Global water resources and hydrologic processes; water availability, flooding, and water quality issues from physical and economic geogaphical perspectives. Prereq: Geography of the Nutural Environment or consent of instructor.

441 Urban Geography (3) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441.)

443 Rural Geography (3) Geographical appraisal of rural areas of United States: small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 443.)

445 Geography of Resources (3) Study of factors related to variations in resource availability from time to time and place to place; energy and metallic resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examination of transportation systems, their effects on trade patterns, land use, location problems, and development. Prereq: 141 or 340 or consent of instructor.

450 Process Geomorphology (3) (Same as Geology 450.)

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.

502 Registration for Use of Facilities (2-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before-degrees is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

504 Research Design (3) Geographical research from selection of topic and development of research design through field work and final report.

505 Directed Research (2-6) Research on problems as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.

506 Directed Readings (2-6) Readings on topics of interest as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.
600 Doctoral Research and Dissertation (3-15) P/NP
   or letter grade.
609 Seminar in Geography (3-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. S/NC or letter grade.
625 Seminar in Historical Geography (3) Prereq: 525 or consent of instructor. May be repeated. Maximum 6 hrs.
633 Seminar in Physical Geography (3) Prereq: 533 or consent of instructor. May be repeated. Maximum 6 hrs.
635 Seminar in Biogeography (3) Prereq: 535 or consent of instructor. May be repeated. Maximum 6 hrs.
641 Seminar in Urban Geography (3) Prereq: 541 or consent of instructor. May be repeated. Maximum 6 hrs.
643 Seminar in Rural Geography (3) Prereq: 443 or consent of instructor. May be repeated. Maximum 6 hrs.
649 Seminar in Geography of Transportation (3) Prereq: 549 or consent of instructor. May be repeated. Maximum 6 hrs.
663 Seminar in Geography of the American South (3) Prereq: Consent of instructor. may be repeated. Maximum 6 hrs.
673 Seminar in Geography of Latin American (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Geological Sciences
(College of Liberal Arts)

MAJOR                                    DEGREES
Geology                                     M.S., Ph.D.

Harry Y. McSween, Head

Professors:
Hatcher, Robert D., Jr. (Distinguished Scientist), Ph.D. .............. Tennessee
Klepser, Harry J. (Emeritus), Ph.D. Ohio State
Kopp, Otto C., Ph.D. .......................... Columbia
McLaughlin, Robert E. (Emeritus), Ph.D. Tennessee
McSween, Harry Y., Ph.D. ........................ Harvard
Misra, Kula C., Ph.D. .......................... Western Ontario
Taylor, Lawrence A., Ph.D. ...................... Lehigh
Walker, Kenneth R. (Carden Prof.), Ph.D. ............................. Yale
Walls, James G. (Emeritus), Ph.D. ............................. North Carolina

Associate Professors:
Broadhead, Thomas W., Ph.D. ........................ Iowa
Byerly, Don W., Ph.D. ............................ Tennessee
Clark, G. Michael, Ph.D. ........................ Penn State
Decontu, Paul A., Ph.D. ........................ Minnesota
Driese, Steven G., Ph.D. ........................ Wisconsin
Dunne, William M., Ph.D. ........................ Bristol
Labotka, Theodore C., Ph.D. .................. Catech
Mckinney, Michael L., Ph.D. ...................... Yale
Williams, Richard T. II., Ph.D. ................. VP&SU

Assistant Professors:
Delcourt, Hazel R., Ph.D. ............................. Minnesota
Mora, Claudia I., Ph.D. ............................ Wisconsin

The Department of Geological Sciences offers both the M.S. and Ph.D. degrees in Geology. Persons interested in these programs should contact the Director of Graduate Admissions in the department.

For admission, each applicant must provide transcripts of previous university work, two rating forms or letters of recommendation, and GRE scores, including the subject exam in geology (or in another area if geology was not the area of previous university-level concentration). Students are not admitted under provisional or non-degree status.

Prerequisite for both degrees is a Bachelor's degree, including coursework in mineralogy, optical mineralogy, petrology, stratigraphy, paleontology, structural geology, and field geology. One year each of coursework in calculus and chemistry and one year of coursework in biology, physics, or statistics are also required. Applicants lacking any of these may be admitted, but the deficiencies must be removed within the first year without graduate credit. 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 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 525 during 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. At least 14 hours at the 500 or 600 level, including at least one course from each of the following groups:
   Group I: 510, 530, 560, 580.
   Group II: 521, 525, 545, 546, 550, 557, 561.
   Group III: 570, 571, 576, 577.
4. Eight hours of additional graduate coursework.

THE DOCTORAL PROGRAM

The candidate for the Ph.D. program, in addition to that for the M.S. program, must either have a Master's degree in Geology, or a Bachelor's degree plus completion of 9 hours of coursework from the list in #3, above, including one course from each group. These courses may be taken while completing other course requirements.
Graduation requires passing a comprehensive examination, taken no later than the end of the second year, completion of all course requirements with a minimum 3.0 GPA, completion of the language requirement, and successful oral defense of the dissertation.

The comprehensive examination includes both written and oral parts in which the candidate will be tested on his/her knowledge of the area concerning the proposed dissertation and 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 is required in addition to the 24 hours of Dissertation 800. The coursework includes the sum of 6 hours of 600-level geology courses, 12 hours of 500-level or higher geology courses, and 6 hours of additional graduate courses. Extra-departmental coursework is encouraged. Registration in 596 is required during the first four years in residence.

509 Topics in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. S/NC or letter grade.
510 Topics in Cartography (3) Trends, concepts, problems, and methods in cartography. Prereq: 411 and 412 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
510 Topics in Remote Sensing (3) Applied research using imagery for interpretation and mapping of geographic data. Prereq: 413 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
515 Topics in Quantitative Geography (3) Multivariate analysis. Applied to problems in geography and problems utilizing appropriate computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 415 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
517 Geographic Information Management and Processing (3) Concepts and methods in management of geographic information. Database design, manipulation, sampling and analysis. Prereq: Consent of instructor.
519 Graduate Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of department before registration. May be repeated with consent of instructor. Maximum 6 hrs.
521 Topics in Cultural Geography (3) Examination of trends, problems, and methods in cultural geography. Prereq: 421 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
524 Topics in Political Geography (3) Geographic consequences of public decisions; understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
525 Topics in Historical Geography (3) Examination of trends, concepts, and methods in historical geography. Prereq: 425 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
533 Topics in Physical Geography (3) Examination of trends, problems, and methods in geography of land surface systems and in modern climatology. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
535 Topics in Biogeography (3) Examination of trends, problems, and methods in biogeography. Prereq: 435 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
536 Plant Communities and Plant Geography (4) (Same as Botany 536.)
541 Topics in Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 441 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
549 Topics in the Geography of Transportation (3) Examination of trends, problems, and methods in transportation geography and transportation networks. Prereq: 449 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.
550 Regional Geomorphology (3) (Same as Geology 550.)
577 Biological Conservation (3) Analytical treatment of politics, policies, and forms of biological conservation as practiced in the United States and abroad. Prereq: Consent of instructor.
591 Foreign Study (1-15) See page 31. Prereq: Written consent of department prior to registration. S/NC or letter grade.
592 Off-Campus Study (1-15) See page 31. Prereq: Written consent of department prior to registration. S/NC or letter grade.
593 Independent Study (1-15) See page 31. Prereq: Written consent of department prior to registration. S/NC or letter grade.
599 Geographic Concept and Method (3) Traditional and modern geographic thought; readings on nature, scope, problems, and methods of geography. Prereq: Consent of instructor.
410 Advanced Mineralogy (3) Crystal chemistry of mineral samples.

420 Paleoecology (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 I (3) Survey of preservational processes and geologically important representatives of each major phylum. Practicum. 2 hrs and 1 2-hr lab.

422 Invertebrate Paleontology II (3) Survey of higher invertebrates: Annelida and other worms, mollusks, arthropods, echinoderms, graptolites, conodonts, and brachiopods: Functional morphology, skeletal structures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.

425 Evolution and Geologic Record (3) Evolution of life view from fossil record. Extinction, macroevolutionary and evolutionary rates. Prereq: 320 or 2 hrs and 1 seminar. 2 hrs and 1 lab.

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

450 Regional Geology of the United States (3) Evolution of geologic provinces within U.S., integration of several types of geologic data. Prereq: 330, 340, 370.

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 environment. Prereq. 12 hrs of geology courses. 2 hrs and 1 3-hr lab or field period.

460 Principles of Geochemistry (3) Application of chemical principles to geologic problems. Crystal chemistry and relation between basic atomic structure and properties of rock-forming minerals. Interaction of electromagnetic radiation and crystalline solids. Optical properties of minerals, visible and infrared spectroscopy, and x-ray diffraction. Laboratory exercises emphasize thin section and x-ray diffractometer methods of mineralogy. Prereq: 310 and 368 or equivalent. 2 hrs and 1 lab.

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

505 Structure of the Southern and Central Appalachian (3) Structural development of Southern and Central Appalachian Plateau Proterozoic-early Paleozoic rift-drift platform margin through processes related to compressional events producing accretional elements that formed Appalachian through the Paleozoic. Comparisons to similar orogens. Prereq: Structural Geology.

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

520 Advanced Paleontology (3) Detailed analysis of selected groups of fossil organisms; functional morphology, evolutionary development.

521 Data Analysis in Geology and Paleobiology (3) Application of statistical and other quantitative techniques to geologic and paleontologic data. 2 hrs and 1 seminar.

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

526 Petrology 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.

530 Physical Geology (3) Examination of the sequence of events and processes through which Earth experienced significant changes during the last 4.6 billion years. Prereq: 101-02. Same as Botany 410. 2 hrs and 1 lab.


536 Water Supply and Wastewater Treatment (3) Desalination processes, and formation of geologic structures. Prereq: Consent of instructor. 3 hrs and 1 lab.

540 Seminar in Geologic (1) Introduction of geology of Southern Appalachians. 1 hr plus fieldtrips.

545 Sandstone Petrology/Physical Sedimentology (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.

550 Regional Geomorphology (3) Integrative approach to the study of geomorphologic regions by stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, sections, and physiographic zones. Prereq: Consent of instructor. Maximum 6 hrs. (Same as Geography 550.)

555 Seminar in Quaternary Studies (3) Interdisciplinary examination of contemporary issues in the dynamics of pattern and process in Quaternary landscapes; responses of plant, animal, and human populations to environmental changes during glacial/interglacial cycles. Prereq: Consent of instructor. Maximum 6 hrs. (Same as Botany 555 and Zoology 555.)

556 Quaternary Geology of North America (3) Interpretation of geologic, stratigraphic, and sedimentologic evidence in order to reconstruct Quaternary land- scapes in glaciated, periglacial, and nonglacial regions of North America; and the relative roles of the last three glacial stasis of the North American glaciers with paleo-oceanographic changes in Atlantic and Pacific Oceans. Prereq: 101 or consent of instructor.

557 Quaternary Paleoclimatology (3) Perturbation, process, and pattern within Quaternary ecosystems; climatic change and vegetational responses during last 2.5 million years. Prereq: Consent of instructor.


561 Aqueous Geochemistry (4) Introduction to and applications of equilibrium geochemistry; application to earth surface environments; geochemistry of natural water, weathering reactions, and early sediment diageneic. Prereq: Chemistry 120-30. 3 hrs and 1 lab or seminar.


580 Geochemical Analysis (3) Collection and treatment of geochemical information. Application of x-ray fluorescence, and atomic absorption spectrophotometric techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.

589 Experimental Geochemistry Laboratory (1-3) Independent lab study of problems in geochemistry using experimental and analytical techniques. Prereq: Consent of instructor.

570 Advanced Structural Geology (3) 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.

571 Regional Tectonics and Structural Geology (3) Major tectonics of belts, and some crustal and processes that form them. Comparison of internal structure of mountain chains and how they function in increasing continental crust. Examples from different parts of the world. Prereq: Structural geology or consent of instructor.

575 Plate Tectonics and Orogeny (4) Tectonic development of orogenic belts in context of newest aspects of plate tectonic theory; current literature and ongoing research for both modern and ancient examples. Prereq: 370 or consent of instructor. 3 hrs and 1 seminar.

576 Reflection Seismology (3) Interpretation of geologic structure and stratigraphy using seismic data. Effects of velocity anomalies, multiples and complex reflector geometry. Application to hydrocarbon exploration. Prereq: Stratigraphy and sedimentology, structural geology, and 470 or consent of instructor.


580 Ore Petrology (3) Detailed study of ore deposits: petrology of ore-venture assemblages. Prereq: 480 or consent of instructor. 2 hrs and 1 2-hr lab.

590 Special Problems in Geology (1-3) Directed study or special topics. Prereq: Consent of instructor. May be repeated. Maximum 10 hrs.

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

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

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

594 Field Problems in Geology (1-2) Literature study and seminars on specific regions of geologic interest, supplemented by extended field trip. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

595 Selected Topics in Geology (1) Presentation of graduate, faculty, and visiting scientist research. Registration required each semester except summer for resident full-time graduate students. S/N/C only.

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

610 Seminar in Mineralogy (2) May be repeated with consent of department. Maximum 6 hrs.

620 Seminar in Paleontology (2) May be repeated with consent of department. Maximum 6 hrs.

630 Seminar in Petrology (2) May be repeated with consent of department. Maximum 6 hrs.

640 Seminar in Sedimentary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

650 Seminar in Geomorphology and Quaternary Geology (2) May be repeated with consent of department. Maximum 6 hrs.
Germanic and Slavic Languages
(College of Liberal Arts)

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

Profiessors:
David E. Lee, Head

Falen, James E., Ph.D. Pennsylvania
Fiene, Donald M., Ph.D. Indiana
Fuller, H. W. (Emeritus), Ph.D. Wisconsin
Kratz, Henry, Ph.D. Ohio State
Osborne, J. C., Ph.D. Northwestern
Rice, Martin P., Ph.D. Vanderbilt
Ritzenhoff, Ursula C., Ph.D. Connecticut

Associate Professors:
Hodges, Carolyn R., Ph.D. Chicago
Lauckner, Nancy A., Ph.D. Wisconsin
Lee, David E., Ph.D. Stanford
Mellor, C. J., Ph.D. Chicago

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

THE MASTER'S PROGRAM
The department requires a minimum of 30 semester hours including 15 hours of course work numbered 500 and above and 6 hours of Thesis 500.

THE DOCTORAL PROGRAM
The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

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

Degree Requirements
Candidates must complete a minimum of 83 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program consists of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   A minimum of 24 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 650 (3); French 512 (3), German 512 (3), or Spanish 512 (3); French 515-16 (2,2) or German 520 (3).
   At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists of at least 18 hours, (excluding French 584 or German 520). At least 12 of which must be at the 500 or 600 level.

3. Cognate Field: Six hours must be in graduate courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized measures that may be used for this purpose include applicable portions of the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute.

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

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

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, subject to staffing needs.

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

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

521 Works of Dostoevsky in English Translation (3)
Crime and Punishment, Brothers Karamazov, and other works. No foreign language credit.

522 Works of Tolstoy in English Translation (3)
War and Peace, Anna Karenina, and other works. No foreign language credit.

550 Studies in Russian Literature (3) Content varies. May be repeated. Maximum 9 hrs.

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

Health, Leisure, and Safety

(College of Education)

MAJORS DEGREES
Public Health ......................... M.P.H.
Recreation and Leisure Studies ........ M.S.
Safety Education and Service .......... M.S., Ed.S.
School Health Education .............. M.S., Ed.D.
Health Education ..................... Ed.D.

Charles B. Hamilton, Head

Professors:
Gorski, June, Dr.P.H. .................. UCLA
Hamilton, Charles B., Dr.P.H. ........ Oklahoma
Hayes, Gene E., Ph.D. ............... North Texas State
Kirk, Robert H., Ph.D. ............... Indiana
Neuens, James (Adjunct), Ph.D. ...... Illinois
Wallace, Bill C., Ed.D. ............... Northern Colorado

Associate Professors:
Haughton, Betsy (Adjunct), Ed.D. ....... Columbia
Krick, Ken L., Re.D. .................... Indiana
New, John C., Jr. (Adjunct), D.V.M. Texas A&M
Pursley, R. Jack, Ph.D. ............... Iowa
Rickett, lan R., Ph.D. ................. Brown
Thompson, A. F., Ph.D. .............. Michigan State

Research Associate Professor:
Putnam, Sandra L. (Adjunct), Ph.D. .... Brown

Assistant Professors:
Aldrich, Tim E. (Adjunct), Ph.D. ....... Texas
Blackmon, James T., Ed.D. ............ Tennessee
Blanton, Mary Dale, Re.D. ............ Indiana
Ellison, Jack S., Ed.D. ............... Tennessee
Levin, Barbara (Adjunct), M.D. ......... California(San Francisco)
Presely, Velma W., Ed.D. .............. Tennessee
Zemel, Paula C., (Adjunct), Ph.D. .... Wayne State

Lecturer:
Duffy, Mary, M.D. .................... Pennsylvania

The Department of Health, Leisure, and Safety offers graduate programs leading to the Master of Science, the Master of Public Health, the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy with a major in Education. Inquiries should be directed to the department head.

Health

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

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

The Doctor of Philosophy with a major in Education offers a concentration in health education and choice of supporting specializations from public health or safety as listed under Education.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

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

406 Death, Dying and Bereavement (3) Aspects of dying, death and handling trauma of loss. Medical, financial, physical, legal and social implications of death. F Sp

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

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

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

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

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

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

502 Registration for Use of Facilities (3-15) Required faculty before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 Trends and Issues in Health Education (3) Comprehensive study and analysis of history, philosophy, principles, problems and trends of and in health and health education. F

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

530 Curriculum Development for Health Education Programs (3) Analysis of current health education cur-

Russian

GRADUATE COURSES

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

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

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

520 Prossemnar (3) Bibliography; methods; illustrative problems; preparation of papers.
riucia for elementary and secondary schools, community and health care settings. Sp
540 Evaluation In Health Education (Principles of evaluation of various health education programs in regard to health knowledge, attitudes, and behavior. Construction of instruments and criticism of existing instruments. Sp
550 Graduate Workshop (1-3) Specific health/wellness or health promotion issues. Special health problems in concentrated period of time. May be repeated. Maximum 12 hrs.
570 Special Topics (1-3) For graduate students, in-service teachers and other health professionals. Health/wellness or health promotion issues. May be repeated. Maximum 12 hrs.
590 Research Methods in Health (Basic research techniques in variety of health settings. Development of research skills and problem identification for research topic. (Same as Public Health 590). F
593 Directed Independent Studies (1-3) Individual identification and study of health/wellness or health promotion problem/issue. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Internship/Research in Safety and Health (3-6) (Same as Public Health 601.) Prereq: Consent of major advisor. F
610 Critical Analysis of Writing and Research (3) Analysis of writing and research in health related areas. F
620 Advanced Research Techniques in Health (3) Advanced theory and techniques of research design and methodologies in health discipline. Prereq 590, 610. Sp
650 Health Aspects of Gerontology (3) Knowledge and understanding of biological, psychological and sociological aspects of aging related to health and wellness of individual. (Same as Public Health 650.) Su
655 Seminar in Nation's Health (3) Comprehensive study of definition, determinants, resources and health status of nation. (Same as Public Health 655.) F
660 International Health (3) Study of quality of health, health promotion and health services in countries throughout world. (Same as Public Health 660.) Sp
493 Directed Independent Study (1-3) Individual in-depth study of selected issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
502 Registration for Use of Facilities (1-5) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time. May be repeated. May be counted toward degree requirements. May be repeated. S/NC only. E
505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in identified areas of public health utilizing workshop format. May be repeated. Maximum 9 hrs.

THE MASTER'S PROGRAM
The M.P.H. is a non-thesis program requiring completion of 38 semester hours of coursework including 9 weeks of field practice. Field practice provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in an actual work setting. Students must complete all assigned prerequisite courses and 21 semester hours of the curriculum prior to enrollment in the program. Approval must be received from the Public Health Academic Program Committee and is contingent on consent of major advisor, formal written proposal by the student, and completion of an additional research methods course. Written guidelines stipulating expectations and eligibility criteria are available.

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

GRADUATE COURSES
400 Consumer Health (3) (Same as Health 400.)
410 Health in the Work Environment (Fundamental activities in field of industrial health aimed at reducing health problems for employees. Workplace health hazards and problems of concern to nurses, medical staff, management, engineers and others in industrial health and safety fields. Prereq: Consent of instructor. May be taken for credit by occupational health concentration majors. F
480 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs. E
493 Directed Independent Study (1-3) Individual in-depth study of selected issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
502 Registration for Use of Facilities (1-5) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time. May be repeated. May be counted toward degree requirements. May be repeated. S/NC only. E
505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in identified areas of public health utilizing workshop format. May be repeated. Maximum 9 hrs.
509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interaction with medicine and other academic and professional disciplines. Speakers both internal and external. May be repeated. Maximum 4 hrs. (Same as Nutrition 590, Public Health Education 509 and Social Work 509.) S/NC only. F,Sp
512 Industrial Hygiene Controls (4) Activities in comprehensive practice of industrial hygiene controls: planning and applying hygiene techniques and instrumentation in solution of workplace hazards. Prereq: Pre-2,11. Sp
513 Industrial Hygiene Instrumentation and Sampling (3) Instruments and methods for evaluating industrial environment for personal exposure to chemical and physical stressors affecting worker's health. Lecture, demonstration, and laboratory. Prereq: 511, MPH (OEHS) major, and consent of department. Sp
514 Industrial Toxicology and Occupational Exposure (3) Principles of industrial toxicology, basic toxic mechanisms, portal of entry, physiological and psychological responses. Occupational exposure assessment, physical factors and environmental conditions that influence exposure characterization, statistical assessment and sampling, and transport of contaminants into general environment. Prereq: 1 yr of general chemistry and 1 semester human physiology. F
521 Organization Theory and Health Care Delivery (3) Administrative and organization theory related to health facilities, operations, and management of community hospital. Case discussions and problem-solving exercises; managerial functions and skills. F
523 Management in Extended Care Settings (3) Managerial concepts and theoretical foundations in management of long-term health services programs. Management and operation of health services programs for patients and institutionalized populations. Focus on the role of managers and managers of programs who work in facility, community, and long-term care settings which provide activities of daily living and special psychosocial environmental needs. Programs for home health services, convalescent and extensive medical rehabilitation, nursing homes, congregate living centers and similar type health programs. Prereq: 521 or consent of instructor. F
525 Financial Management of Health Programs (3) Financial management concepts and practices applied to health services programs. Fundamentals of budgeting, costing, financial reporting, rate setting, financial reporting and control. Opportunities to apply techniques. Prereq: 525 or consent of instructor. Sp
530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology. Prereq: Basic knowledge of mathematics. Prereq: Introductory statistics or consent of instructor. F
540 Research Methods in Epidemiology (3) Basic measure of disease, disease occurrence, and health incidence and prevalence; application of discipline's research methods. Basic measures of risk, concepts of bias and causal reasoning. Study design options and analytic approaches. Prereq: Pre-30, F,Sp
542 Advanced Epidemiologic Methods (3) Both cohort and case-control studies; design and interpretation of study, and general attention to calculations and formulation of professional literature. Conceptual and empirical perspective of epidemiologic approaches to prob-
Recreation and Leisure Studies

Graduate study in a major in Recreation and Leisure Studies leads to the Master of Science degree. Professional preparation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program with the department of Human Performance and Sport Studies.

The M.S., with thesis and non-thesis options, requires completion of 32 semester hours.

The following retention policy applies to graduate students seeking the M.S. with a concentration in sport administration/management:

1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who fails below this standard will be advised in writing by the department head of the need to discuss the matter with his/her advisor.
3. If a student's overall GPA remains below 3.0 for a second semester, the student will have his/her degree status revoked.

GRADUATE COURSES

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

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

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

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

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

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

510 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today's society, safety, security, and social issues affecting delivery of leisure services. Prereq: Consent of instructor. 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, history of field, and relationship of ideas to contemporary society and to professional practice. Prereq: Consent of instructor. F

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

521 Leisure Counseling and Facilitation Techniques (3) Investigation of concepts and techniques of leisure counseling; introduction and practice of various leisure facilitative techniques; use of increased personal leisure awareness as desired but concurrent with other counseling. Prereq: 520 or consent of instructor. Sp

522 Clinical Aspects in Therapeutic Recreation (3) Concepts and techniques utilized by experienced and advanced therapeutic recreation specialist: clinical issues, comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services. Prereq: Consent of instructor. F

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 techniques, capital and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp

Safety

Graduate programs are available leading to the Master of Science with a major in Safety Education and Service (thesis and non-thesis options) and to the Specialist in Education with a major in Safety Education and Service. The S.S.W. with thesis and non-thesis options, requires completion of 30 semester hours. The Specialist in Education (Ed.S.) requires 30 semester hours beyond the M.S. An internship and research of a significant safety problem are included as professional development activities.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

441 Driver and Traffic Safety Education (4) Preparation of traffic safety instructors for school, colleges, industry and commercial agencies. Students required to teach at least two hours per week. Valid driver's license required. 3 hrs and 2 labs. F, Sp

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

443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interference in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs. Sp

452 General Safety (3) Principles, practices, and procedures in general safety. Safety problems in school, traffic, recreation, industry, home and other public areas. F

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May 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 in behavioral sciences as related to variation incidence of accidents.

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

535 Emergency Management
(3) Civil and defense problems: tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries. Sp

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

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

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 Liberal Arts)

MAJOR DEGREES
History ............................................................ M.A., Ph.D.

Russell Buhite, Head

Professors:

Associate Professors:

Assistant Professors:
Brummett, Palmira R., Ph.D. .......... Chicago Diacon, Todd A., Ph.D. ................ Wisconsin

Gavitt, Philip R., Ph.D. ..................... Michigan Plummer, Betty L., Ph.D. ............... Mary land Wakeman, Rosemary, Ph.D. .......... California (Davis)

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis public history concentration. The doctoral program has concentrations in American and European history with special focuses in the areas identified under group II doctoral fields.

Detailed information may be obtained from the Director of Graduate Studies in History who also advises all incoming students.

THE MASTER'S PROGRAM

Admission Requirements
1. Successful completion of a baccalaureate degree from an accredited institution, preferably with a major in history.
2. Acceptable scores on the Graduate Record Examination (general and subject).

General Requirements
Complete 510 and a 600-level research seminar normally during the fall and spring semesters of the first year in the graduate program. Complete 521 in preparation for the M.A. examination. As many as 9 related hours may be taken outside the department. As many as 9 graduate credits taken elsewhere may be applied toward the M.A. degree. Except by prior approval of the Director of Graduate Studies, a student's coursework must be at the 500 level or above.

Thesis Option
Twenty-four hours of coursework and 6 hours of Thesis 500 for a total of 30 hours are required. Thesis students are required to select one M.A. field and write a thesis. At the end of the program the thesis 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. Theses in each field are written within one week of 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 secondary field.

M.A. Fields
United States (colonial to present)
Premodern Europe
Modern Europe
Asia
Latin America

Concentration in Public History
The public history program is a 37 hour non-thesis program that trains students in the field of American history and an aspect of public history such as historical editing and management of historical collections, presentation of historical subjects through non-traditional formats and preservation of historical sites.

The program consists of 19 hours within the history department (including 510, one research seminar, three readings courses, and 599) and an additional 18 hours (primarily outside the department) selected by the student and the supervising professor from an approved list. Students must maintain a 3.0 grade-point average in history courses taken and in courses taken outside the department and earn a B or higher in 599. Public history students take the same M.A. examination in American history as the non-thesis M.A. students.

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 and subject).

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

Language Requirements
Students must demonstrate competence in one foreign language through coursework or examination. The student's doctoral committee may specify any other languages or research tools, such as statistics, essential for the student's preparation. The foreign language requirement must be fulfilled before taking the comprehensive examination.

Comprehensive Examination
The comprehensive examination is to be taken no later than the semester following the term in which the student has completed the residence, coursework, and language requirements. A student stands examination in one field selected from Group I and one field selected from Group II below. Both parts are to be taken during the same semester. Each part consists of a 4-hour written taken within one week by a
2-hour oral examination. A grade of pass or fail is awarded at the conclusion of the oral examination. A student who fails the comprehensive exam (or any part) must repeat it no later than the following semester. A student who fails the same examination twice or who does not take the examination when required will be dropped from the graduate program. Upon completion of the residence, coursework, and language requirements and passing the comprehensive examination, a doctoral student may be admitted to candidacy.

DOCTORAL FIELDS

Group I:
- Premodern Europe
- Modern Europe
- United States (colonial to present)

Group II:
- To be defined by the student's doctoral committee from within one of the following fields: Political (U.S.), Socio-Economic, Military/International Relations, Regional/Local (U.S.), National/Regional (Non-U.S.).

DISSERTATION AND DEFENSE

Original research forms the basis for the dissertation. Doctoral candidates must register for a minimum of 3 hours of 600 Dissertation Research each semester and must complete 24 hours of dissertation credit. A final oral defense is given on the dissertation in its historical context. The program must be completed within four years from admission as a potential candidate.

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when the student uses University facilities and/or faculty time before degree requirements. May be repeated. S/NC only. E
510 Foundations to Graduate Study in History (3) Assumptions and methods of historians. Required of all candidates for the M.A. degree only. May be repeated. S/NC only. E
521 M.A. Readings (3) Directed readings in preparation for M.A. examinations. Open only to Master's candidates in history. May be repeated. Maximum 6 hrs. S/NC only. E
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- and 20th-Century United States (3) Reading seminar: secondary sources on 19th- and 20th-century United States. Focus varies. May be repeated. Maximum 15 hrs.
551 Topics in the History of Foreign Relations (3) Reading seminar: secondary sources on foreign relations. Focus varies. May be repeated. Maximum 15 hrs.
552 Topics in Military History (3) Reading seminar: secondary sources on military history; military operations, social impact of war and naval strategy in foreign policy. May be repeated. Maximum 15 hrs.
554 Topics in Comparative Social and Economic History (3) Reading seminar: secondary sources on multinational topics, comparatively structured. Focus varies. May be repeated. Maximum 15 hrs.
555 Topics in United States Social and Economic History (3) Reading seminar: secondary sources on U.S. social and economic history. Focus varies. May be repeated. Maximum 15 hrs.
556 Topics in European Social and Economic History (3) Reading seminar: secondary sources on social or economic history of European nations. Focus varies. May be repeated. Maximum 15 hrs.
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 in the United States. Focus varies. May be repeated. Maximum 15 hrs.
566 Topics in U.S. Religious History (3) (Same as Religious Studies 566.)
571 Topics in Applied History (3) Seminar to develop practical skills applicable to museology, historical preservation, material culture, historical agencies, historical editing, and other areas of applied history. Focus varies. May be repeated. Maximum 15 hrs.
580 Topics in History (3) Reading seminar: secondary sources for new topics. Focus varies. May be repeated. Maximum 15 hrs.
591 Foreign Study (1-15) See page 31.
592 Off-Campus Study (1-18) See page 31.
593 Independent Study (1-15) See page 31.
599 Historic Preservation Internship (4) Practical experience with an historical agency, project site or near completion of graduate program. Written analysis of relationship between academic program and applied project.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
621 Directed Readings (3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/NC only.
632 Seminar in Modern European History (3) Seminar in primary sources culminating in scholarly paper in modern European history. Focus varies. May be repeated. Maximum 15 hrs.
641 Seminar in Early American History (3) Seminar in primary sources culminating in scholarly paper in American history. Focus varies. May be repeated. Maximum 15 hrs.
651 Seminar in Military and Foreign Relations History (3) Seminar in primary sources culminating in scholarly paper in military or foreign relations history. Focus varies. Not restricted by national grouping. May be repeated. Maximum 15 hrs.
658 Seminar in United States Regional and Local History (3) Seminar in primary sources culminating in scholarly paper in United States regional and local history. Focus varies. May be repeated. Maximum 15 hrs.
580 Seminar in History (3) Research seminar in primary sources culminating in scholarly paper in aspect of history not covered in another 600-level research seminar. Focus varies. May be repeated. Maximum 15 hrs.

HOME ECONOMICS

DEGREE

College of Human Ecology

MAJOR

DEGREE

Home Economics

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

ADMISSION REQUIREMENTS

A completed file for review includes the Graduate School application file, College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section or Miller's Analog Test (MAT) score, and three Graduate School Rating Forms completed by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology. The M.S. in Home Economics requires an undergraduate degree in Home Economics.

THE MASTER'S PROGRAM

The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 6 hours in statistics and/or research methodology, 9 hours in program planning, implementation, and evaluation (may be selected from agricultural extension, home economics education, or other courses approved by committee), 3 hours in the integrative nature of home economics (HE 510), and 9 (thesis option) or 12 (non-thesis option) hours in the College of Human Ecology. At least one course is to be from each department in the College. The thesis option requires 6 hours of Thesis 500, and the non-thesis option requires a creative project (3 hours) and 3 hours of approved electives. An oral/written comprehen-
sive examination will be administered at the end of the program.

ACADEMIC COMMON MARKET

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

Home Economics Education

(College of Human Ecology)

Students pursuing graduate study in home economics education or extension are encouraged to enroll in the multidisciplinary Master's degree in Home Economics. Human Economics Education courses may be selected to meet requirements of that program. Home economics teachers may choose courses within this area for updating and certification renewal. Graduate coursework in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

GRADUATE COURSES

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor. F, A

515 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress, techniques, methods and purposes. Prereq: 420 or equivalent, F, Sp, A

520 Supervision in Home Economics in the Public Schools (3) Program planning, organization and administration of vocational home economics education. Supervision of pre-service and in-service home economics professionals. Prereq: Classroom teaching experience. Sp

525 Home Economics Adult Education (3) Development and administration of community-based home economics programs for adults. Prereq: Consent of instructor. Sp

530 College Teaching in Home Economics (3) Instructional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor: F, A

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

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

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

Human Ecology

(College of Human Ecology)

MAJOR DEGREE

Human Ecology Ph.D.

Graduate study leading to the Doctor of Philosophy with a major in Human Ecology is available in the Departments of Child and Family Studies, Nutrition, and Textiles. Retailing, and Interior Design. Concentration areas are child development, family studies, nutrition science, textile science, and consumer environments. A major challenge of the doctoral program in Human Ecology is to draw upon the basic research generated from the natural sciences, social sciences, humanities, and the arts, and to provide a holistic perspective that contributes to the improvements of individual and family well being. For example, the physiological chemist may study metabolic-dietary interrelationships and psychologists may study child behavior. But, it is within human ecology that the nutrient needs of the growing child are considered along with the factors that affect the child's acceptance of different foods. Within the College of Human Ecology, research from one discipline is enhanced by encompassing and utilizing the findings of research from other disciplines.

ADMISSION REQUIREMENTS

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

THE DOCTORAL PROGRAM

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

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

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

CONCENTRATION IN CONSUMER ENVIRONMENTS

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

Requirements are a minimum of 80 hours including:

1. HEED 530
2. HE 610
3. HRA 532, ID 570 and RCS 550
4. HRA 537 or RCS 590 or ID 590 (2 hours)
5. Minimum 9 hours of statistics and research methods
7. Twenty-four hours of dissertation;
8. Electives for 34 hours approved by the committee. (Students must take at least 18 hours in one of three specialty areas: foodservice and lodging administration, retail and consumer sciences or interior design; including a minimum of 9 hours required at the 600 level.)

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

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

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

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

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

515 Issues and Trends in Human Ecology (1-3) Research and theory related to current issues. Prereq: Consent of instructor. E

520 Directed Study in Human Ecology (1-3) Integrates topics. Prereq. At least 9 hrs of graduate study in college including courses from at least two departments or consent of instructor. May be repeated. Maximum 6 hrs. E

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

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

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

Human Performance and Sport Studies
(College of Education)

MAJORS DEGREES
Human Performance and Sport Studies M.S., Ed.D.
Education ......................................................... Ph.D.

Joan Paul, Head

Professors:
Capan, Edward K. (Emeritus), Ph.D. Iowa
Howley, Edward T., Ph.D. Wisconsin
Kozar, Andrew J., Ph.D. Michigan
Lay, Nancy E., Ph.D. Florida State
Liemohn, W. P., Ph.D. Iowa
Paul, Joan, Ed.D. Alabama
Phillips, Madge M. (Emeritus), Ph.D. Iowa
Watson, Helen B. (Emeritus), Ph.D. Michigan
Wintberg, C. A., Ph.D. Michigan

Associate Professors:
Bietel, Patricia A., Ed.D. North Carolina (Greensboro)
Bond, Vernon, Jr., Ed.D. Tennessee
Croskey, R. J., M.F.A. Southern Methodist
DeSensi, J. T., Ed.D. North Carolina (Greensboro)
Jones, Ralph E., Ph.D. Toledo
Mead, B. J., Ph.D. Purdue
Morgan, W. J., Ph.D. Minnesota
Naimy, Thomas, M.D. Washington (St. Louis)

Assistant Professors:
Bassett, David R., Jr., Ph.D. Wisconsin
Borowiak, Patricia C., M.S. Georgia State
Kelley, D. R., Ed.D. Georgia State
Lewis, J. L., Ed.D. Tennessee
McCutchan, M. G. Ed.D. North Carolina (Greensboro)

Adjunct Faculty:
Acker, J. E., M.D. Tennessee
Buckles, Tina M., Ph.D. Tennessee
O'Connell, D. G., Ph.D. Toledo

THE MASTER'S PROGRAM

The Department offers the Master of Science with a major in Human Performance and Sport Studies with the following concentrations:
Exercise science (adapted physical education, exercise physiology/fitness)
Motor behavior
Pedagogy in physical education
Sociocultural foundations (history, philosophy, sociology)
Sport administration/management (an interdisciplinary concentration with Health, Leisure and Safety)

The Master of Science program permits the student to select a thesis or non-thesis option. The thesis option requires a minimum of 30 hours. The non-thesis option requires 32 hours, including a project. All M.S. students must complete a course in research design or statistics and register for two credits of Physical Education 601.

THE DOCTORAL PROGRAM

The Doctor of Education with a major in Human Performance and Sport Studies is available with the following concentrations:
Exercise science (adapted physical education, exercise physiology/fitness)
Motor behavior
Sociocultural foundations (history, philosophy, sociology)

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

ADMISSION REQUIREMENTS

Applicants are required to complete the departmental application which will be sent to all persons upon their initial inquiry about the program. Specific questions about these programs should be directed to the head of the Department of Human Performance and Sport Studies.

The following retention policy applies to all graduate students seeking a degree in the Department of Human Performance and Sport Studies:
1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who 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, Department of Human Performance and Sport Studies, The University of Tennessee, Knoxville, TN 37996-2700.

Human Performance and Sport Studies

GRADUATE COURSES

405 Sociology of Sport (3) (Same as Sociology 405.)
411 Adapted Physical Education (3) Developmental disabilities, other physical/mental handicaps and variant/invariant characteristics of specific syndromes germane to motor development/programming for those with special education needs.
423 Readings in Physical Education (2) Review of current and classic literature in physical education.
480 Physiology of Exercise (3) Functions of body in muscular work: physiological aspects of fatigue, training and adaptation to environment. Prereq: Human Physiology or general physiology. 2 hrs and 1 lab. (Same as Zoology 480.)
500 Thesis (1-15) P/NP only. E
501 Special Project (3) Culminating experience for non-thesis major. Research study suitable for publication, or prepration requiring special written work. Prereq: 2 credits.
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
509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nutrition 509, Nursing 509 and Social Work 509.)
511 Administrative/Supervisory Processes in Physical Education (3) Organizational concepts, management strategies, and supervisory techniques related to Physical Education programs at all levels.
512 Application of Theory to Curricular/Methodological Decision in Physical Education (3) Application of curricular principles and theories to educational situations for development of curricula and lessons in physical education. Various methodological approaches.
514 Advanced Philosophy of Sport (3) Major philosophical theories of sport. Various conceptual, moral, aesthetic, and social-political issues.
515 Social Theories of Sport (3) Liberal, democratic and Marxist social theories of sport. (Same as Sociology 514.)
528 Motor Behavior: A Theoretical Perspective (3) Motor behavior from information processing perspective; overview of current research that supports theoretical bases. Prereq: Undergraduate course in general psychology or consent of instructor.
531 Biomechanics of Human Performance (3) Human movement; teaching, coaching and sports medicine. Prereq: 422 or equivalent.
532 Seminar in Research Techniques in Physical Education (3) Evaluation, compare, and contrast research techniques in physical education with considerations for and experiences in appropriate review, design, and research process development.
533 Psychology of Sport (3) Social psychological factors influencing human behavior in sport context; discussion of contemporary theory, research, and methodology. Prereq: General psychology course or consent of instructor.
534 Motor Behavior and Skill Acquisition (3) Topical explanation and application of principles of human movement behavior to acquisition and performance of skills necessary to success in professional or recreational sport.
535 Sport Administration (3) Development of knowledge and analytic skills desirable for middle and upper level managers/administrators in sport business/organization.
541 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of physical education and/or sport. May be repeated.
542 Sociological Aspects of Sport and Physical Education (3) Social and cultural factors influencing sport and physical education. Pertinent issues and research applications. Prereq: Consent of instructor. (Same as Sociology 542.)
543 Human Motor Development (3) Changes in selected motor performance and related attribute areas during critical developmental periods within context of perceptual-motor development theories and explanations of factors affecting motor behavior.
544 Theories of Physical/Movement Education (3) Integration of various theoretical approaches to physical education/movement education within cultural context; research and field work.
553 Advanced Adapted Physical Education (2) Curriculum development and teaching methodologies in programming for child with special education needs. Prereq: 4 or consent of instructor. Coreq: 554.
554 Advanced Adapted Physical Education Practicum (1) Curricula and methodologies implemented in lab in school for handicapped. Coreq: 553.
tation and integration of creative dance in grades K-6. Mini-teaching experience.

420 Jazz: Level III (2) Instruction and practice in advanced jazz and musical theater dance styles and techniques. Prereq: Dance majors and minors and consent of instructor. May be repeated. Maximum 16 hrs.

430 Modern: Level III (2) Instruction and practice in advanced modern dance techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

450 Composition III (3) Application of choreographic and production skills culminating in presentation of two works. Prereq: 440 and 445 or consent of instructor.

460 Rhythmic Analysis (3) Basic nature and principles of music, rhythm, and rhythmic notation; correlation of dance movement and composition. Prereq: Consent of instructor.

465 Dance Notation (3) Fundamentals of movement notation, notation and reading of elementary movement studies.

480 Dance Through the 19th Century (3) Dance of various societies and culture from pre-history through 19th century.

481 History of Dance II (3) Development of dance in theatre, recreation and education during 20th century.

490 Dance in the 20th Century (3) History and philosophy of dance.

593 Directed Independent Studies (1-3) Independent study in specialized area with dance. Prereq: Consent of advisor. May be repeated. Maximum 9 hrs.

495 Dance Pedagogy (3) Principles and methods of teaching of dance with practical application in mini-teaching experience. Prereq: Upperclass or graduate standing and consent of instructor.

Industrial and Organizational Psychology

(College of Business Administration and College of Liberal Arts)

MAJOR

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

Michael C. Rush, Director

Committee:

Dewhirst, H. Dudley, Management
Dobbins, Gregory H., Management
Fowler, Oscar S., Management
James, Lawrence R., Management
Jenkins, Roger L., Business Administration
Johnson, Michael G., Psychology
Jones, Warren H., Psychology
Ladd, Robert T., Management
Larsen, John M., Jr. (Emeritus), Management
Loingsby, John W., Psychology
Russell, Joyce E., A., 
Schumann, David W., Marketing
Sandstrom, Eric, Psychology

For complete Faculty Listing, see Departments of Management and Psychology.

The Master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research; for university teaching; and for consulting relationships with industry. The program emphasizes a scientist/practitioner model in applying and conducting research based on accepted theory, organizational behavior, psychology, management, and statistics. The programs are administered by a joint committee of the two departments, appointed by the practical attention of the Chancellor and Dean of The Graduate School on recommendations from the two department heads and the program director. It is intended that students entering the I/O Program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses that will assist the students in attaining a reasonable level of sophistication in areas of deficiency.

ADMISSION REQUIREMENTS

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

Two separate applications must be completed: one application for admission to The Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology program. Deadline: New students are admitted in fall semester only, and applications must be received by the Graduate Admissions and Records Office by February 15.

General Requirements

At least one year of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade point average of 3.0 or above is required with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) and the Subject GRP (Psychology) are required. Customarily, those students admitted to the program have performed at or above the 69-79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.) The Subject GRE (Psychology-B1) score will be used in making admission decisions, although special consideration will be given in the case of non- psychology majors.

THE MASTER'S PROGRAM

A thesis is required with 6 semester hours of Management or Psychology 500. The Master's degree can be completed with a maximum of 33 semester hours in the major as follows: Management 567, 568, Psychology 517-18; Psychology 557, Statistics 537, 538.

Twelve hours of additional coursework to be selected primarily from the following with the approval of the student's advisor: Management 511, 522, 610; Management/ Psychology 625, 626, 627, 638; Psychology 505, 550, 610, 620, 621.

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests...
aside from their thesis may register for Management 517, 525, 557 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 690.

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

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

In addition to course requirements, a Master's student must complete a comprehensive examination in general psychology within no more than two years by attaining a score of 630 (or 85th percentile) on the Subject GRE (Psychology 81).

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

THE DOCTORAL PROGRAM

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

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

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

Management 567-58 or Psychology 517-18, Psychology 557, Statistics 537-38.

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

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their dissertation may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 690.

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

Doctoral candidates must pass a final oral examination on their dissertation research. In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology 81) within two years of entry, successfully complete the qualifying examination covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination in the areas of the student's major research and professional interests.

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ph.D. programs in Industrial and Organizational Psychology are available to residents of the states of South Carolina or Virginia. The Ph.D. program is also available to residents of Arkansas or Kentucky.

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

Industrial Engineering

(Graduate of Engineering)

MAJOR

Industrial Engineering .................................. M.S.

John N. Snider, Head

Professors:

Bontadelli, J. A., Ph.D. ....................................... Ohio State

Claycombe, W. W., Ph. D. ........................................... VPI

DePorter, Elden L., Ph.D. ........................................... VPI

Doulet, Dan C. (Emeritus), PE, M.S. Tennessee

Emerson, H. P. (Emeritus), PE, S. B. ............... MIT

Garrison, G. (UTSI), Ph. D. .............................. NC State

LaForge, R. M. (Emeritus), PE, M.S. ............................... Georgia Tech

Loveless, Howard L. (Emeritus), PE, M.S. ....................... NC State

Mitchell, James T. (UTSI), Ph.D. ............... Vanderbilt

Snider, John N., PE, Ph.D. ............................... Ohio State

Westbrook, Jerry D., PE, Ph.D. .............................. VPI

Associate Professors:

Aikens, Charles H., PE, Ph.D. ............... Tennessee

Hailey, M. L. (UTSI), PE, Ph.D. ............... Texas Tech

Hungerford, J. C., Ph.D. ............................... Ohio

Hutchinson, D. H., Ph.D. ............................... Georgia Tech

Kirby, K. E., Ph.D. ........................................... Tennessee

Tippett, Donald T. (UTSI), Ph.D. .............................. Texas A & M

Assistant Professors:

Goodman, Marvin K. (Emeritus), PE, M.S. ...................... Tennessee

Jackson, D. F., M.S. ........................................... Tennessee

Lecturers:

Douglass, S., Ph.D. ........................................... Tennessee

Fortney, W. B., M.S. ........................................... Purdue

Greenwood, T. G., M.S. ........................................... Tennessee

THE MASTER'S PROGRAM

A graduate program leading to the degree of Master of Science is open to graduates of A.B.E.T.-accredited undergraduate curricula in industrial engineering or to graduates of other technical curricula who take prerequisite coursework depending on their academic background. These courses will be determined by the graduate committee. The thesis program requires 24 hours of coursework and 6 hours of

These: A non-thesis option with 30 hours of coursework plus a 3-hour design project is available.

Graduate work in Industrial Engineering provides for concentrations in operations research, engineering management, manufacturing systems, human factors, accounting information systems, reliability and quality control, and traditional industrial engineering. Either one or two minors can be elected in engineering, mathematics, psychology, business, computer science, statistics or economics.

Any 400-level course required in the Bachelor of Science in Industrial Engineering program at The University of Tennessee may not be used for graduate credit in the M.S. graduate program in Industrial Engineering.

GRADUATE COURSES

400 Manufacturing Materials/Processes (3) Characteristics of materials and processes used in modern production systems. Prerequisite: 130, Engineering Science and Mechanics 321.

401 Integrated Manufacturing Systems (3) NC and CNC machine tools, robotics and related materials handling systems, hard automation, alternative integrated manufacturing systems, and manufacturing systems controls. Prerequisite: 400.

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

403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industry. Prerequisite: 302, 401.

405 Engineering Economy (2) Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives involving capital recovery, economic life of equipment, and rate of return on investment.


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

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data. Process control, statistical modeling, experimental design, sampling, single subject experimental designs, classical experimental design methods, and time series models of experiments. Validity and reliability concepts as related to
### Afro-American Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401-02</td>
<td>Special Topics in Comparative Literature</td>
<td>4</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>471</td>
<td>Selected Topics in Asian Studies (3) Content</td>
<td>3</td>
<td>Views of East and West, cultural contacts, interaction, influence of</td>
</tr>
<tr>
<td>483</td>
<td>Afro-American Women in American Society (3)</td>
<td>3</td>
<td>Gender, race, class, gender, race, class, gender, race, class, gender,</td>
</tr>
<tr>
<td>461</td>
<td>African Prehistory (3)</td>
<td>3</td>
<td>Historical and cultural perspectives, political, economic, social</td>
</tr>
<tr>
<td>473</td>
<td>Black Male in American Society (3) Development</td>
<td>3</td>
<td>Economic, social, political, cultural, historical, cultural, political,</td>
</tr>
<tr>
<td>483</td>
<td>Afro-American Women in American Society (3)</td>
<td>3</td>
<td>Gender, race, class, gender, race, class, gender, race, class, gender,</td>
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### Asian Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>421</td>
<td>Comparative Studies in African and Afro-American Societies (3) Education, religion, and social</td>
<td>3</td>
<td>Contact with various African and Afro-American societies, cultural</td>
</tr>
<tr>
<td>450</td>
<td>Issues and Topics in Afro-American Studies (3)</td>
<td>3</td>
<td>Themes, topics, issues, and individuals, may be repeated.</td>
</tr>
<tr>
<td>452</td>
<td>Black African Politics (3)</td>
<td>3</td>
<td>Political, social, economic, cultural, historical, political, economic</td>
</tr>
<tr>
<td>461</td>
<td>African Prehistory (3)</td>
<td>3</td>
<td>Historical and cultural perspectives, political, economic, social</td>
</tr>
<tr>
<td>473</td>
<td>Black Male in American Society (3) Development</td>
<td>3</td>
<td>Economic, social, political, cultural, historical, political, economic</td>
</tr>
<tr>
<td>483</td>
<td>Afro-American Women in American Society (3)</td>
<td>3</td>
<td>Gender, race, class, gender, race, class, gender, race, class, gender,</td>
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### Cinema Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>420</td>
<td>French Cinema (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>421</td>
<td>Italian Literature and Cinema (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>489</td>
<td>Special Topics in Film (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
</tbody>
</table>

### Comparative Literature

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401-02</td>
<td>Special Topics in Comparative Literature (3,3) Content varies. May be repeated.</td>
<td>9</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>489</td>
<td>Special Topics in Film (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
</tbody>
</table>

### Latin American Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral pattern.</td>
<td>3</td>
<td>Political, political, economic, social, cultural, political, economic,</td>
</tr>
<tr>
<td>402</td>
<td>Latin American Studies Seminar (3) Selected topics. May be repeated.</td>
<td>6</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
</tbody>
</table>

### Linguistics

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Topics in Linguistics (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>411</td>
<td>Linguistic Anthropology (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
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<tr>
<td>420</td>
<td>The Development of Historical Linguistics as a Science (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>425</td>
<td>Introduction to Descriptive Linguistics (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>426</td>
<td>Methods of Historical Linguistics (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>429</td>
<td>Romance Linguistics (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>430</td>
<td>The Development of Synchronic Linguistics as a Science (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>435</td>
<td>Structure of the German Language (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
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<tr>
<td>436</td>
<td>History of the German Language (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>471</td>
<td>Sociolinguistics (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>472</td>
<td>American English (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>474</td>
<td>Teaching English as a Second or Foreign Language I (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>475</td>
<td>Teaching English as a Second or Foreign Language II (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>485</td>
<td>Special Topics in Language (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
<tr>
<td>559</td>
<td>Problems in Linguistics: Romance Languages (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic, social, cultural</td>
</tr>
</tbody>
</table>

### Urban Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>The City in the U.S. (3)</td>
<td>3</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>441</td>
<td>Urban Geography (3)</td>
<td>3</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>464</td>
<td>Urban Ecology (3)</td>
<td>3</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
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</tbody>
</table>

### Women's Studies

**GRADUATE COURSES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Topics in Women's Studies (3)</td>
<td>3</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>422</td>
<td>Women Writers in England (3)</td>
<td>3</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>425</td>
<td>Women's Health (3)</td>
<td>3</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
</tbody>
</table>

### Journalism

**MAJOR DEGREES**

<table>
<thead>
<tr>
<th>Field</th>
<th>Degree</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>M.S., Ph.D.</td>
<td>James A. Crook, Director</td>
</tr>
</tbody>
</table>

**Professors:**

- Adamson, June N., M.S. Tennessee
- Ashdown, Paul Q., Ph.D. Bowling Green
- Caudill, C. Edward, Ph.D. North Carolina Miller, M. Mark, Ph.D. Michigan State
- Crook, James A., Ph.D. Iowa State
- Everett, George A., Ph.D. Iowa
- Littmann, Mark, Ph.D. Northwestern Singletary, Michael W., Ph.D. Southern Illinois

**Assistant Professors:**

- Bowles, Dorothy, Ph.D. Wisconsin
- Caudill, Susan M., Ph.D. Tennessee
- Heller, Robert B., M.A. Syracuse

**Adjunct Professor:**

- Haley, Alex

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

### GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>403</td>
<td>International Communications (5) Development and operations of world mass communications channels</td>
<td>5</td>
<td>Time, place, climate, social change, politics, economic factors, form of</td>
</tr>
<tr>
<td>412</td>
<td>Opinion Writing (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic factors, form of</td>
</tr>
<tr>
<td>414</td>
<td>Magazine Article Writing (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic factors, form of</td>
</tr>
<tr>
<td>434</td>
<td>Psychology of Gender (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic factors, form of</td>
</tr>
<tr>
<td>466</td>
<td>Rhetoric of the Women's Rights Movement (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic factors, form of</td>
</tr>
<tr>
<td>483</td>
<td>Afro-American Women in American Society (3)</td>
<td>3</td>
<td>Language, culture, history, society, politics, economic factors, form of</td>
</tr>
</tbody>
</table>

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


433 Advanced Editing (3) Sensitivity to language and editing skills. Deadline writing, layout, and production. Prereq: 203.

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


490 Advanced Photojournalism (3) Advanced principles and techniques of black and white photography, introduction to color photography. News and feature photographs and photo essays. Prereq: 290 or consent of instructor. Sp.

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

520 Press-Government Relations (3) Development of adversary relationship between journalists and government officials. Philosophical and legal basis for open reporting of government. Use of press by candidates and incumbents. 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. F.

535 Publications Management (3) Problems in management, production, market analysis, and design. Techniques of writing, editing, and presenting comprehensive stories in printed and other material: regional and specialized magazines. Individual editorial projects. Prereq: 420 or consent of instructor. Sp.

540 Seminar in Newspaper Operations (3) On-site study of newspaper management operations. Positioning medium for its target audience and how this affects profitability. Prereq: 550 or consent of instructor. F.

550 Writing and Editing Projects (3) Specialized writing or editing interests: agriculture, politics, labor, finance, science, technical, general publications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E.

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

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in color, shape, texture, and other design elements. Prereq: 203 or Advertising 350 or Broadcasting 430 or equivalent. F.

590 Communications and International Development (3) Relationship between mass communications and development of nations. Role of communications media in the newly developed nations in "Third World" regions of globe. Communications as facilitator of international cooperation.

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

598 Internship (3) Professional work in journalism supervised by editor or manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core curriculum.

Law

(College of Law)

MAJOR

DEGREES

Law ..................... J.D., J.D.-M.B.A., J.D.-M.P.A.

Marilyn Yarbrough, Dean

Professors:

Cohen, Neil P., LL.M. ........................ Harvard
Cook, Joseph G., LL.M. ..................... Yale
Gray, R. Macdonald (Emeritus), LL.M. ..................... George Washington
Hardin, Patrick, J.D. ........................ Chicago
Hess, Amy M., J.D. ........................ Virginia
Jones, Durward S., J.D. ..................... North Carolina
King, Joseph H. (Distinguished Prof.), J.D. ..................... Pennsylvania
Lacey, Forrest W. (Emeritus), S.J.D. ..................... Michigan
Le Clercq, Frederic S., LL.B. ..................... Duke
Lloyd, Robert M., J.D. ........................ Michigan
Miller, Charles H. (Emeritus), J.D. ..................... Duke
Overton, Elvin E. (Emeritus), S.J.D. ..................... Harvard
Phillips, Jerry J., J.D. ........................ Yale
Picquet, Cheryn, M.S.L.S. ..................... Tennessee
Rivkin, Dean H., J.D. ........................ Vanderbilt
Sebest, John A., J.D. ..................... Michigan
Sewell, Toxey H. (Emeritus), LL.M. ..................... George Washington
Sobieski, John L., J.D. ..................... Michigan
Wirtz, Richard S., J.D. ..................... Stanford

Associate Professors:

Anderson, Gary L., LL.M. ........................ Harvard
Ansley, Frances Lee, LL.M. ..................... Harvard
Benterna, William J., J.D. ..................... Miami
Best, Reba, M.L.S. ........................ Florida
Black, Jerry P., Jr., J.D. ........................ Florida
Davies, Thomas Y., J.D. ..................... Northwestern
Dessem, Lawrence, J.D. ..................... Harvard
Eisele, Thomas D., J.D. ........................ Harvard
Gray, Graef B., J.D. ........................ Stanford
Jones, Jack D. (Emeritus), J.D. ..................... Wyoming
Kovac, Susan D., J.D. ........................ Stanford
Morgan, Peter W., J.D. ........................ Virginia
Mutter, Carol A., J.D. ..................... Georgetown
Pierce, Carl A., J.D. ........................ Yale
Reynolds, Glenn H., J.D. ..................... Yale
Stark, Barbara, J.D. ..................... New York
Stein, Gregory M., J.D. ..................... Columbia
Thompson, James E., J.D. ..................... Florida

Assistant Professor:

Thorpe, Steven R., J.D. ........................ Mercer

Instructor:

Hoover, Mary Jo, J.D. ..................... Brooklyn
Moore, Jean, M.A.L.S. ..................... Michigan

Current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available in the College of Law Bulletin from the Admissions Office, The University of Tennessee, College of Law, 1505 West Cumberland Avenue, Knoxville, Tennessee 37996-1800. 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 a numerical basis from 0.0 to 4.0. A grade of 0.0 or below is a failure.

Eligible law students may receive up to six (6) semester hours of credit toward the J.D. degree for acceptable performance in upper-level courses that materially contribute to the study of law and which are taken in other departments at The University of Tennessee. Course selection and registration are subject to guidelines approved by the law faculty which include the requirement that any such course be acceptable for credit toward a graduate degree in the department offering the course.

Refer to the Law Bulletin for current degree requirements.

DUAL J.D.-MBA DEGREE PROGRAM

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

Admissions

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

Curriculum

A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawing from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual
Academic years.
Addition to taking normal course loads for four
be required. Students pursuing the dual degree
as the requirements for this college.
Stated in the front section of this catalog as well
Graduate School's degree requirements as
Program may not receive credit towards the J.D.
by the instructor without conversion.
Offering the course. The official academic record
for any appropriate purpose in the college
College may be used on a regular graded basis
grade. Grades earned in courses of either
course in which the student has earned a 2.3
grade of Satisfactory for a College of Law
which the student has earned a B grade or
Satisfactory for a graduate business course 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 may be taken in the other program except as
courses qualify for credit without regard to the
dual program.
Awards of Grades

- For grade recording purposes in the College of Law for graduate business courses and in the College of Business Administration for law school courses, grades awarded will be converted to either Satisfactory or No Credit and will not be included in the computation of the student's grade average or class standing in the college where such grades are so converted.

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

- Grades earned in courses of either college may be used on a regular graded basis for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

- Non-Law Elective Course Credit

Students enrolled in the J.D.-M.P.A. degree program may not receive credit toward the J.D. degree for courses taken in other departments of the University, except for those taken in conjunction with the dual program.

- Awarding of Grades

Admission

Adjustments for the J.D.-M.P.A. program must make separate application to, and be independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and The Graduate School for the M.P.A. degree. Application must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant's LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made prior to or after matriculation in either the J.D. or the M.P.A. program, but application to the dual program must be taken 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 of credit toward the M.P.A. degree for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821) and are encouraged to take this course prior to entry to the M.P.A. program. 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.

- Professorship and Research

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 other program until 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

Dual degree students who withdraw from the program after 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

Grades for the grading scale acceptable toward
requirements. Grades for law courses will not be
reflected in the cumulative average. Law courses may be taken for credit only by
students enrolled in a graduate degree program.

- Professional Courses

801 Civil Procedure I (3) Binding effect of judgments, selecting proper court (jurisdiction and venue), ascertaining applicable law, and federal and state practice.

803 Contracts I (3) Basic agreement process and legal protections afforded contracts; offer and acceptance, consideration and other bases for enforcing promises; the Statute of Frauds, unconscionability and other controls of promissory liability. Introduction to relevant portions of Article 2 of the Uniform Commercial Code.

804 Contracts II (3) Continuation of Contracts I. Issues arising after contract formation. Interpretation, duty of good faith; conditions, impracticability and frustration of purpose remedies; issues of modification, amendment and delegation. Considerable coverage of Article 2 of the Uniform Commercial Code with respect to remedies, anticipatory reputation, impracticability and good faith.

805 Legal Process I (2) Lawyer-like use of cases and statutes in prediction and persuasion. Analysis and synthesis of common law decisions; statutory interpretation, fundamentals of expository legal writing and legal research.

806 Legal Process II (3) Continuation of Legal Process I. Formal legal writing, appellate procedure, and oral advocacy.

807 Torts I (3) Intentional torts, including battery, assault, false imprisonment, infliction of emotional distress, conversion and trespass, privileges and defenses to intentional torts, negligence, including standard of care and proof of negligence, immunities and limitations on duties; cause in fact; and proximate cause.

808 Torts II (3) Defenses, including contributory negligence, assumption of risk, comparative negligence, and statutes of limitations; strict liability; nuisance; products liability; settlement; problems of multiple defendants; damages; non-tort alternatives for recovery for personal injury; law reform; defamation, invasion of privacy, and wrongful legal proceedings; misrepresentation, injurious falsehood, misappropriation of
commercial values, and interference with contract; con-
809 Criminal Law (3) Substantive aspects of criminal law; general principles applicable to all criminal conduct; specific analysis of particular crimes; defenses to criminal charges.
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 (3) Judicial review; limits on judicial power; national legislative power; regulation of commerce; power to tax and spend; other sources of national power; separation of powers; state taxation and regulation of commerce; intergovernmental immunities.
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.
814 Legal Profession (3) Legal, professional and ethical standards applicable to lawyers.
816 Computer-Assisted Legal Research (6) Introductory to the use of computer data bases and retrieval systems, LEXIS and WESTLAW. Offered periodically throughout the year. May be taken beginning spring of first year of law study. Must be completed satisfactorily prior to end of second year of law study. Prereq: Completion of first draft of appellate brief in 810. S/U only
818 Income Tax (4) What is income; whose income is it; what is the base of taxability; taxation of property; income and capital gains and losses; maximum and minimum tax; deductions and credits; rates (corporate, estate, and trust).
821 Administrative Law (5) Administrative agency decision making processes and judicial review of administrative decisions: procedural standards for informal and formal administrative adjudication and rule-making (attention to federal Administrative Procedure Act); constitutional due process standards in administrative settings; and availability, scope and timing of judicial review of agency actions.
822 Legislation (3) Interpretation and drafting of statutes; legislative process; and legislative power; comparison of judicial views on legislative process with both realities of legislative process and applicable constitutional principles.
824 Local Government (3) Distribution of power between state and local governmental units; sources of power; planning of financing transactions and negotiating and drafting documents. Financing techniques: equipment leasing, employment, housing and future files; contracts; issues in commercial financing, and other important issues not normally covered in Commercial Law. Prereq: 820.
846 Constitutional Law II (3) First Amendment rights to freedom of religion, expression, association and press; Fourteenth Amendment equal protection rights against discrimination as to race, sex, etc.; rights to franchise and apportionment; substantive and procedural due process; civil rights under federal law; prosecution of post-Civil War Amend- ments to Constitution.
848 Civil Rights Actions (3) Litigation to vindicate constitutional rights in private actions against the government officials and as rights protected by other civil rights legislation: elements of cause of action under 42 U.S.C. sec. 1983; actions against federal government officials under the Bivens doctrine; institutional and individual immunities; relationship between state and federal courts in civil rights actions; and remedies for violations of constitutional and other civil rights.
849 Discrimination and the Law (3) Comparison of race, sex and other invidious discriminatory practices as they affect political participation, education, employment, housing and future files; conflict; issues in legislative enforcement of post-Civil War Amend- ments to Constitution.
851 Constitutional Law Seminar (2) Current constitution law problems.
855 Criminal Procedure II (3) Pre- and post-trial procedures: procedural standards for informal and formal judicial proceedings in a criminal case: bail; preliminary hearing; grand jury; judicial review of agency actions; plea bargaining; jury trial; double jeopardy; and post- conviction relief. Federal Rules of Criminal Procedure.
866 Environmental Law and Policy (3) Study, through methods of public policy analysis, of responses of legal and other institutions to environmental problems: Environmental Policy Act; Clean Air Act; Clean Water Act; National Environmental Policy Act; and selected regulatory issues.
867 Environmental Law Seminar (2) Selected topics in environmental law.
869 Natural Resources Law (3) Nature of interests; conveying; royalties, grants and reservations, leases, and taxation of natural resources.
873 American Legal History (3) Selected topics in American legal history.
875 Empirical Studies of Legal Institutions (3) Social, economic and organizational factors that affect behavior of clients, lawyers, judges and other actors in legal institutions. Empirical studies of subjects; social structure and organization of bar; factors that affect filing, processing and disposition of claims in civil justice sys- tem and factors that affect process of case dispositions in criminal prosecutions: plea bargaining process. Fac- tors that sometimes cause "law in action" to operate differently than "law on the books."
879 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, use of economics in legal decision making and legal criticism.
881 Law and Literature (3) Systematic study of literature and its application to legal thought and to accurate, fluent, and creative legal composition.
883 Law, Language, and Reality (3) Intermediate level Jurisprudence course. Law as the means attempt to defend, direct, and administer human activity; explora- tion, through methods of etymological, of ethical values underlying formal legal reasoning and legal concepts.
886 Public International Law (3) Law-creating processes and doctrines, principles and rules of law that regulate mutual behavior of states and other entities in international system.
887 International Business Transactions (3) Legal status of persons abroad; acquisition and use of property within a foreign country; doing business abroad as a foreign corporation; engaging in business within a foreign country; expropriation or annulment of contracts or concessions.
889 International Seminar (2) Current inter- national law problems. Prereq: 886 or 887.
891 Comparative Law (3) Introduction to civil law sys- tems of France and Germany, focusing on legal institu- tions, methodology, and aspects of law of obligations and commercial law.
895 Labor Relations Law (3) Political, social and eco- nomic influences on the development of federal labor rela- tions laws; employee rights of self-organization; union and employer unfair labor practices; strikes, lockouts, boycotts and collective bargaining; employee rights of self-organization; institutional and individual immunities; relationship between state and federal courts in civil rights actions; and remedies for violations of constitutional and other civil rights.
898 Employment Law (3) Legal regulation of em- ployment relationship: legal, social and economic influences in employee-employer relationship; employment discrimination; legally prescribed minimum standards of compensation and safety; restraints on termination of employment; regulation of retirement systems.
898 Arbitration Seminar (2) Arbitration of labor agree- ments; jurisdictional and legislative developments; nature of process; relationship to collective bargaining; selected arbitration problems; selected aspects of collective agreements; and role of arbitrators and arbitrators. Prereq: 895.
899 Labor Relations Seminar (2) Selected labor rela- tionsship problems.
904 Civil Advocacy (6) Supervised fieldwork, requiring students to assume primary responsibility for represent- ing clients with various civil legal problems. Exploration of the substantive and ethical issues of interviewing, counseling, planning, investigation and discovery, drafting, negotia- tion, litigation, and other professional tasks necessary to provide competent representation of clients' interests in state and federal courts, or before state and federal administrative officers or judges. Prereq: 902 and third- year standing.
906 Criminal Advocacy (6) Supervised fieldwork, re-
quiring students to accept primary responsibility for
defending clients accused of crime in Knox County.
Exploration of theory, practice and ethics of interviewing,
counseling and representation, class notes, quizzes,
routine and trial at preliminary hearings and misde-
meanor trials. Prereq: 920 and third-year standing. Rec-
ommendation of course instructor. May be repeated.
915 Conflict of Laws (3) Jurisdiction, foreign judg-
ments, and conflict of laws.
916 Federal Courts (3) Jurisdiction of federal courts;
conflicts between federal and state judicial systems.
918 Remedies (4) Judicial remedies: damages, restitu-
tion, and equitable relief; availability, limitations and
measurability of remedies; comparison of con-
tract, tort and property-related remedies.
920 Trial Practice (3) Litigation through simulation, trial
problems and preparation and presentation: basic trial
strategy; professional responsibility; fact investiga-
tion and presentation of evidence; selection and instruc-
tion of jurors; opening and closing arguments. Written
work: motions, interrogato-
ries or memoranda. Prereq: 813.
921 Pre-Trial Litigation (3) Civil pre-trial process. Draft-
ing of actual pre-trial documents in civil cases: complaint,
motions; jurisdiction; classification, filing, pleading,ple-
ning; discovery. Prereq: 855.
923 Complex Litigation (3) Advanced civil procedure
laws dealing with conditions that are not covered in the
law involving multiple claims and multiple parties: per-
missive and compulsory joinder; intervention; disposi-
tion of class action litigation, class discovery in large cases; judicial control of complex
litigation; res judicata and collateral estoppel problems.
925 Appellate Practice Seminar (2) Federal and Ten-
nessee Supreme Court, review of rules of federal courts;
review of complete records of several United States Supreme Court cases and preparation of
an appellate brief based on record of actual case.
927 Interviewing, Counseling and Negotiation (3) Develop-
ment of conceptual and practical frameworks for
understanding interviewing, counseling and negotia-
tion, and lawyer's role in tasks. Readings of different meth-
ods, strategies and perspectives from recent literature
involving knowing skills. Simulations and videotape
exercises, drafting of documents. Relevant ethical issues
and techniques of dispute resolution. Not open to stu-
dents who have taken 904 or 906.
929 Teaching Clients the Law (3) Communication of
law as basis for decision by persons other than lawyers.
Decisions made by individuals predated by instruction; legal
papers, motions to dismiss and for summary judgment,
and various discovery papers.
932 Litigation (3) Advanced civil procedure course
covering conditions that are not covered in the
law involving multiple claims and multiple parties: per-
missive and compulsory joinder; intervention; disposi-
tion of class action litigation, class discovery in large cases; judicial control of complex
litigation; res judicata and collateral estoppel problems.
935 Appellate Practice Seminar (2) Federal and Ten-
nessee Supreme Court, review of rules of federal courts;
review of complete records of several United States Supreme Court cases and preparation of
an appellate brief based on record of actual case.
937 Estate Planning Seminar (2) Problems of estate
planning, relationship to estate planning of law and
practice of fiduciary administration, insurance, property,
wills, future interests, trusts, corporations, partnerships,
and the drafting of estate plans; drafting of wills and
implementing documents for hypothetical clients. Prereq: 973. Prereq or coreq: 818 and 935.
940 Land Finance Law (3) Financing devices: mort-
gages, deeds of trust and land contracts; problems of priorities; transfer of secured interests when debt is
assumed or taken subject to security interest; default,
exercise of equity of redemption and statutory right of
redemption; mechanics and materialmen's liens, con-
temporary developments in areas as condominiums,
cooperatives, housing subdivisions, and shopping cen-
ters.
941 Land Acquisition and Development Seminar (2)
Alternative business forms and major documents (notes,
debt, equity, prospectus, etc) necessary to accomplish ac-
quisition or development of large tracts of land; prepared and presented for seminar discussion. Prereq: 940.
943 Land Use Law (3) Land use planning; nuisance
and zoning and eminent domain.
950 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. Prepa-
tion for student to think effectively concerning use of
computers. Prior computer experience not necessary.
953 Education Law (3) Compulsory attendance laws;
governmental control over curriculum and extracur-
cicular activities; academic freedom; privacy and due
process rights of students and teachers; religion in public
schools, public aid to parochial schools; equality of
educational opportunity.
956 Entertainment Law (3) Role of law and lawyer in
entertainment industry. Course content varies. Music
industry; music copyright laws; artist/manager relations-
ships; record contracts; independent production; industry, labor
unions; and performing right organizations.
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; unauthorized practice of
medicine; medical education, licensing, and special-
ization; hospital staff privileges; medical malpractice
liability; standard of care, proof, causation, defenses, and
damages; informed consent, consent, and cooperation;
right of treatment, and death and dying; control of communicable
diseases; organ transplantation and medical resource
allocation.
965 Law and Mentally Disabled Seminar (2) Psycho-
logical/psychiatric principles and relationship to law;
voluntary admission and civil commitment; rights of
mentally disabled; release and deinstitutionalization; and
mental health professional-patient relationship.
970 Income Tax II (3) Corporate reorganizations and
distributions; transactions among corporations and
shareholders. Prereq: 918.
971 Income Taxation of Entities (2) Federal income
taxation of partners and partnerships, Subchapter S
corporations and shareholders, and related topics. Pre-
req: 918. Recommended prereq or coreq: 970.
973 Wealth Transfer Taxation (3) Transfers of wealth
at death (estate tax) and during life (gift tax), and of
property at death (transfer tax); fiduciary income taxation.
Recommended prereq or coreq: 818 and 935.
975 Tax Theory (3) Comparative study of methods
and purposes of governmental revenue collection through
examination of economic theory and various actual and
proposed schemes of taxation. Prereq: 918.
980 Insurance (3) Types of insurance: life, property,
health, accident and liability insurance; regulation of
the insurance industry; interpretation of insurance con-
tracts; insurable interest requirement; conditions, war-
ranties and representations; coverage and exclusions;
duties of agents; excess liability; subrogation; and bad
faith actions against insurers. Liability insurance; defense
problems: duty to defend, notice and cooperation issues,
and conflicts of interest.
983 Products Liability (3) Scope of doctrine and the-
ories of recovery; potential plaintiffs and defendants;
statutory and contractual limitations on recovery; dam-
gages; causation; and defenses.
985 Social Legislation (3) Systems other than tradi-
tional welfare: Workmen's Compensation; re-
quirements for covered employee-employer relationship;
Injuries or occupational diseases arising out of and
in the course of employment; nature of disability; medical and death benefits; and exclusiveness of compensation
remedy against employer and co-employees. Social
Security disability benefits; eligibility; benefits for disabled
people; administrative process; rights to fair hearing; and
counsel fees.
990 Issues in 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. Maxi-
mum of once each semester; maximum of twice in 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) Completion of a potentially publish-
able case note, comment, or other article for the Tennes-
see Law Review. May be repeated. S/N only. (Will not
count toward total number of elective upper division
courses taken S/N/C.)
997 moot Court (1) Participation as member of faculty-
supervised interscholarly moot court competition.
May be repeated. S/N 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.
facilitation of information transfer. Students will demonstrate:
1. Knowledge of the historical role of libraries and other information agencies in society.
2. A knowledge of how information flows through contemporary society.
3. An understanding of the role of the librarian and/or information specialist as a mediator between information and the user with an emphasis on the improvement of the quality of information services in response to the needs of society.
4. An understanding of and competence in the selection, acquisition, organization, storage, retrieval, and dissemination of information.
5. An understanding of bibliographic control and knowledge of information sources in various formats and subjects.
6. An understanding of management theory and practice, particularly as these are related to library and information services.
7. A knowledge of research methods sufficient to enable them to engage in effective problem solving.
8. To provide services to the state, region, and nation in association, consulting, and continuing education activities which will promote the development and improvement of information systems and services such that the school's contributions reach beyond its immediate academic programs. The school will provide:
1. Continuing education for information professionals and, on a selective basis, to persons outside the information field.
2. Advisory services to libraries and other types of organizations.
3. Leadership for professional associations.
4. To conduct basic and applied research which promotes the generation of new knowledge, services, and technology. The school will encourage:
1. Research which strengthens its instructional and public service programs.
2. The use of a variety of research methods.
3. Sharing the results of its research.
4. Increased research quality and productivity.

ADMISSION REQUIREMENTS
Candidates who have at least a 3.0 average in the junior and senior years will receive first consideration. Applicants are required to take the general test of the Graduate Record Examination. The test should be taken at least one semester in advance of application for admission to The Graduate School. A personal data sheet and three recommendations (obtained from the Graduate School of Library and Information Science) should be returned to the director of the school. Foreign applicants are required to take the Test of English as a Foreign Language.

MASTER OF SCIENCE IN LIBRARY SCIENCE
The program leading to the Master of Science in Library Science involves a total of 39 semester hours of graduate courses, 18 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis option is available, with 6 hours required for thesis credit. At least 33 hours must be taken in the Graduate School of Library and Information Science, allowing up to 6 hours outside the school with a maximum of 6 from outside the University. Upon completion of the program, all students are subject to a final examination. For students who elect the thesis option, the examination will be a defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination.

FINANCIAL ASSISTANCE OPPORTUNITIES
Employment with The University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with some other libraries and information agencies in the Knoxville area.

Academic programs 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.L.S. in Library and Information Science, write to Admissions, Gradarate School of Library and Information Science, University of Tennessee, 804 Volunteer Blvd., Knoxville, TN 37996-4330.

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

GRADUATE COURSES
430 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 18th century. Sp
475 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 475.)
500 Thesis (1-15) P/NP only E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
510 Information Professionals and Their Organizations (3) Variety and prospects of information professionals; professional organizations; achievements, responsibilities, goals, and issues. E,Su,A
520 Technical Services I (3) Technical services principles and techniques: acquisitions, basic manual and automated cataloging, structure and use of library catalogs, basic subject organization and indexing. E,Su,A
521 Technical Services II (3) Library of Congress subject organization and description, automated cataloging and cataloging of serials and more difficult materials. Prereq: 520. Sp
530 Information Sources and Services (3) Basic bibliographic and information services, online databases. Interview and search techniques, selection and evaluation of information collections and development and evaluation of services. E,Su,A
531 Sources and Services for the Social Sciences (3) Information sources in social sciences: political science, sociology, psychology, geography, history, anthropology; sources and services in business, education, and law. Prereq: 530. Sp
532 Sources and Services in Technology (3) Information sources in engineering, physical and life sciences. Prereq: 530. Sp
533 Sources and Services for the Humanities (3) Information sources in philosophy, religion, fine arts, performing arts, literature and language, and history. Organization of collections for optimum use. Prereq: 530. Su
540 Research Methods in Library and Information Science (3) Research methods applicable to librarianship and information management, especially the conduct of empirical research; analysis of published research. Prereq: Admission to program or consent of instructor. E
550 Library and Information Agency Management (3) Management and organizational concepts applicable to libraries and other information agencies. Prereq: Admission to program or consent of instructor. E
551 School Libraries and Media Centers (3) Planning, implementing and evaluating school library programs. Curricular involvement, role of technology, relationships with district and state services. Prereq: 550 and 550 and consent of instructor. F,Su
552 Academic Libraries (3) Development and present status, mission and objectives within higher education institutions, trends, problems, recurring issues. F
553 Special Libraries and Information Agencies (3) Development and present status, scope and objectives, administrative and organizational problems and techniques. F
554 The Library in the Community (3) Application of marketing analysis for planning and policy formulation. Public library focus. Sp
560 Development and Management of Collections (3) Philosophy and process of building and managing collections in library agencies and institutions, environment; community analysis; policy statements; collection evaluation, and preparation of buying lists. Prereq: 530. E,Su,A
561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution of materials acquired by libraries; various types of publishers. F
562 Serials (3) Serials selection: selection, acquisition, bibliographic control, storage, maintenance, and public service. Prereq: 560 or consent of instructor. Sp
563 Nonbook Materials (3) Selection, acquisition, mediagraphic representation, storage, utilization, and programming; microforms, films, video, sound recordings, and as information media. F
564 Records Management and Archives (3) Objectives and functional elements of records management and archives programs within various types of organizations, management of creation, distribution, retention, storage, retrieval, protection, and disposition of organizational records regardless of information medium. Sp
569 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 569)
572 Resources for Young Adults (3) Critical survey of books and related materials for young adults, personal, vocational and recreational needs and interests. Evaluation, selection, and utilization for school and public libraries. Sp
573 Services for Children and Young Adults (3) Philosophy and objectives of public and school library serv-
The Master's degree requires a minimum of 30 semester hours of study approved by the student's committee, a thesis, and an oral examination. Within the biotechnology program only, a non-thesis M.S. option is available. Students choosing this option are expected to complete: (1) two summers' co-op experience in an appropriate industry. An evaluation by supervisor and a written report are required (529, Biotechnology Practicum Cooperative Experience, maximum 4 hrs.); (2) A written report in the form of a scientific paper in an area of specialization chosen by the student and advisor. The minimum requirements for the doctoral degree include at least 6 hours above the 600 level, 24 semester hours of course 600, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a defense of dissertation. Individual programs may have additional requirements.

CONCENTRATIONS

Biotechnology
The biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells and their components for the production of useful materials. This will be achieved at the M.S. level by a prescribed course of study of the biology and biochemistry of cells and molecules; by formal study of cells and of engineering aspects of biotechnology; and by the development of special expertise in areas such as animal and plant tissue culture, recombinant DNA technology and risk assessment, and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience.

Required courses are Life Sciences 509, 511, 512, 531, 532; Biochemistry 511; Microbiology 410; Botany 451; Chemical Engineering 475; and Zoology 507.

Cellular, Molecular and Developmental Biology
The inter-departmental program in cellular, molecular and developmental biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells.

Required courses are Life Sciences 511, 512, 531, and 532.

Environmental Toxicology
The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxics.

Developed courses are Biochemistry 561, 582, 604; and Life Sciences 510.

Ethology
Ethology is the naturalist study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; comparative psychology; human ethology; and behavioral ecology and sociobiology.

Required courses for the Master's are Psychology/zoology 450, 459; Zoology 524, 583; Statistics 351-32; and Zoology/Psychology 516.

The Ph.D. requirements are the same as for the Master's with the additional requirements of one additional statistics course and six semester hours of courses numbered above 600 approved by student's committee.

Physiology
The inter-departmental program in physiology includes research in the areas of cellular, comparative, developmental, exercise, muscle, neurophysiology, regulatory, or reproductive.

Required courses are Zoology 520, 521, Human Anatomy, Comparative Vertebrate Biology, 420; Biochemistry 410; four 600-level seminars; and a statistics sequence.

Plant Physiology and Genetics
The program provides student training in basic and applied research in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.

Required courses are Life Sciences 510; Botany 521, 522; Biochemistry 511, 512; Plant and Soil Science 471 or Zoology 560; Plant and Soil Science 551, Microbiology 410.

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required for students not otherwise registered during any semester when student uses University facilities and for faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E
509 Biotechnology Seminar (1-2) Topics of impor- 
7 tance and introduction to biotechnology. May be repeated. Maximum 6 hrs.

510 Special Topics in Life Sciences (1-3) Special- 
2 izations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant, physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

511 Advanced Cellular Biology (3) Cell structures and functions at molecular and supramolecular level. Membrane structure, function, and biogenesis; cellular com- 
2 munication; receptors and membrane flow; growth regulation and oncocenoses; plant cell structure and function; contractility and motility; mitosis and meiosis; blood and immune cells.

512 Advanced Molecular Biology (4) (Same as Bio- 
6 chemistry 512.)

525 Research Practicum in Life Sciences (1-3) Indi- 
2 vidual sections for each of biotechnology; cellular, mo- 
2 lecular and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 6 hrs.

529 Biotechnology Practicum Co-operative Ex- 
2 perience (2) Work experience in commercial or- 
2 ganization for students undertaking non-thesis option of biotechnology concentration. Evaluation by supervisor and written report by student. May be repeated. Maximum 4 hrs.

531 Biotechnology Laboratory (3) Growth of microor- 
2 ganisms, analysis of extracellular and intracellular com- 
2 ponents.

532 Biotechnology Laboratory (3) Pilot scale yeast 
2 cultivation, cultivation environment, purification and charac- 
2 terization. Application of purified enzymes to food pro- 
2 duction fermentations and fermentation process control.

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

610 Advanced Topics in Life Sciences (1-3) Topics 
2 vary. May be repeated. Maximum 6 hrs.

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**Logistics**

*See Marketing, Logistics and Transportation*

**Management**

*(College of Business Administration)*

**MAJOR**

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

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Oscar Fowler, Head

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Professors:

- Boling, Ronald W. (Emeritus), Ph.D.
- Stanford
- Dewhurst, H. Dudley, Ph.D.
- Pennsylvania
- Lawrence R., Ph.D.
- Utah
- Kealj, A. H. (Emeritus), MBA
- Pennsylvania
- Larsen, John M., Jr. (Emeritus), Ph.D.
- Purdue
- Neel, C. Warren, Ph.D.
- Alabama
- Reed, S. Kyle (Emeritus), Ph.D.
- Virginia
- Reese, Don (Emeritus), Ph.D.
- Idaho
- Stahl, Michael J., Ph.D.
- California
- Rensselaer
- Vance, S. C. (Emeritus) (W.B. Stokely Prof.)
- Pennsylvania
- Wagoner, George A. (Emeritus), M.S.
- Indiana
- Whitlock, G. H. (Emeritus) (Distinguished Prof.)
- Tennessee

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Assistant Professors:

- Bowers, Melissa R., Ph.D.
- Clemson
- Fryxell, Gerald E., Ph.D.
- Indiana
- Judge, William Q., Ph.D.
- North Carolina
- Kaplan, Lori A., Ph.D.
- Michigan
- Noon, Charles E., Ph.D.
- Michigan

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**ASSISTANT PROFESSORS:***

- Fowler, Oscar S., Ph.D.
- Gilbert, Kenneth C., Ph.D.
- Ladd, Robert T., Ph.D.
- Maddox, Robert C., Ph.D.
- Miller, Alex, Ph.D.
- Rush, Michael C., Ph.D.
- Russell, Joyce E. A., Ph.D.

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**SPECIAL JOBS:**

- Dobbins, Gregory H., Ph.D.
- VPI

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**BUSINESS ADMINISTRATION CONCENTRATIONS**

For complete listing of MBA and Ph.D. program requirements, see Business Adminis- 
2 tration.

**MBAs Concentrations:**

- Management, Forest Industries Management.
- Management of Technology-Based Organi- 
2 zations (3) Role of technology and innovation in formu- 
2 lation and implementation of strategy. Management of research and development function and coordination with other functions. Management of start-ups and engineers.

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**551 Management of New Ventures (3) Integration of 
2 various functional disciplines and their application to general management of ventures formed both within larger corporations and independently. Preparation of a venture plan, case analysis.

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**567-69 Proseminar in Industrial/Organizational Psy- 
2 chology (3,3) Basic thought, concepts, and issues required for advanced graduate study in industrial and organizational psychology. Must be taken in sequence during student's first year of study in industrial and organizational psychology program. Consists of seminars and research and must be repeated for all non-industrial/organizational psychol- 
2 ogy program students. (Same as Psychology 517-18.)

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**571 International Management (3) Analysis of environ- 
2 ment of international business firms and impact of inter- 
2 nal and external factors on managerial decisions.

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**593 Directed Independent Study (1-3) Topic of mutual interest. Available only by prearrangement with super- 
2 vising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

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

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**601 Research Methods (3) Cases, group projects, discussion; organ- 
2 ization theory; organizational effectiveness; contex- 
2 tal factors of organizations; environment, size, technol- 
2 ogy; organizational structure configurations, organiza- 
2 tion design; social influences on organizational effective- 
2 ness; motivation, leadership, human resource planning, and career implications with strategy, planning, and decision making.
Management Science

(College of Business Administration and Intercollegiate Program)

MAJORS DEGREES

Management Science M.S., Ph.D.
Business Administration MBA

Kenneth C. Gilbert, Chairperson

Associate Professor:
Gilbert, Kenneth C., Ph.D. Tennessee

Assistant Professors:
Bowers, Melissa R., Ph.D. Clemson
Kaplan, Lori A., Ph.D. Michigan
Noon, Charles E., Ph.D. Michigan

Additional Committee Members:
Fowler, Oscar S., Management Leitnaker, Mary G., Statistics Ralston, Bruce A., Geography

THE MASTER'S PROGRAM

The M.S. program in Management Science is an intercollegiate program and is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentration in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology, and other areas, subject to approval by the Management Science Committee.

Admissions Requirements

The Master's program requires three Graduate School Rating Forms and the GRE or GMAT. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in three semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements Hours

Core Requirements 14
Management Science 531, 532, 533, 534
Statistics 563
Applied specialization area (approved by advisor) 9
Statistics elective—500 level or above (approved by advisor) or 6

Mathematics—400 level or above (approved by advisor)
Electives selected from mathematics, statistics, computer science, and/or management science area 9

TOTAL 38

A thesis option is available to qualified students which substitutes 6 hours of thesis credit for the following 8 hours of course work: Management Science 594, 3 hours in the applied concentration area and 3 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student's first semester and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics requirements. On the other hand, a student lacking experience in rigorous senior-level mathematics courses will be asked to take such courses to fulfill the 6-hour mathematics requirement.

The total course load will remain 38 hours for all non-thesis students and 36 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 12 as a function of prior background.

THE DOCTORAL PROGRAM

The Ph.D. program in Management Science under the College of Business Administration is designed to prepare students for research related to the application of mathematical tools to complex decision making. Three primary objectives of the program are:

1. to provide, through management science coursework, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;
2. to provide sufficient advanced study in a supporting area to qualify the graduate for a joint faculty position in the supporting area and management science. The candidate may choose from the business functional areas (accounting, finance, marketing, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
3. to develop in the student, through coursework in mathematics, statistics and computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

Admission Requirements

The doctoral program requires three Graduate School Rating Forms and the GRE or GMAT, in addition to The Graduate School's requirements.

Coursework

A minimum of 48 semester hours of coursework taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be the coursework from a Master's program although a Master's is not a prerequisite for the doctorate. The candidate must complete a minimum of 24 semester hours at The University of Tennessee, Knoxville, at least 6 of which must be at the 600 level. Both of these requirements are also exclusive of thesis or dissertation credits. Entering students who have completed graduate studies in applicable fields will be granted course credits for work which is equivalent to required courses in the program.

The program includes approximately 16 to 20 semester hours of coursework in the applied area.

Qualifying Examinations

The student must demonstrate mastery of probability theory and statistical inference, Statistics 563, 564, by passing a written qualifying examination.

Mastery of 12 to 14 semester hours in mathematics coursework must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement.

Comprehensive Examination

Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation

The student must complete 24 semester hours of Management Science 600: Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate. This 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 graduate grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester's coursework as established by the degree program for full-time students and the next two semester's coursework as established by the degree program for part-time students.

PREREQUISITES FOR MANAGEMENT SCIENCE COURSES

The Management Science Program is interdisciplinary and students in other degree programs are encouraged to enroll in man-
Marketing, Logistics, and Transportation

(College of Business Administration)

MAJOR

Business Administration

DEGREES

MBA, Ph.D.

David J. Barnaby, Head

Marketing

Professors:

Barnaby, David J., Ph.D. Purdue
Cadotte, E., Ph.D. Ohio State
Jenkins, Roger L., Ph.D. Ohio State
Locander, W. B., Ph.D. Illinois
Woodruff, R. B., DBA Indiana

Associate Professors:

McMillan, J. R., Ph.D. Ohio State
Reizenstein, Richard C., Ph.D. Cornell
Rentz, J. O., Ph.D. Georgia
Schumann, D. W., Ph.D. Missouri

Assistant Professors:

Dabholkar, P. A., Ph.D. Georgia State
Cardial, S. F., Ph.D. Houston
Song, X., Ph.D. Virginia
Speck, P. S., Ph.D. Texas Tech

BUSINESS ADMINISTRATION

CONCENTRATIONS

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

MBA Concentration: Marketing.

Minimum course requirements are three courses from the following: 503, 504, 505, 506, 505, 593, 599, Logistics and Transportation 507, Business Administration 510, 599.

Ph.D. Concentration: Marketing.

Minimum course requirements are 12 hours from among the following courses: 601, 602, 603, 604, 605, 606.

GRADUATE COURSES

501 Marketing Management (3) Marketing viewed as total system designed to plan, promote, and distribute goods and services to household consumers and industrial users. Demand analysis as basis for marketing decision-making.

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

503 Buyer Behavior—Analysis for Marketing (3) Consumer behavior concepts and processes developed and applied to market analysis and design, and control of marketing programs. Social psychology and demographic factors that affect consumer product, brand and patronage decisions. Prereq: 501.

504 Analyzing Market Opportunity for Marketing Decisions (3) Major determinants of opportunity in markets, framework for finding markets and analyzing them for opportunity, application of market opportunity analyses to marketing strategy decisions. Prereq: 501.

505 Marketing Research and Information Planning (3) Design of a rigorous marketing study from inception to implementation of results by recognizing key decision points and critically evaluating merit of research project. Prereq: 501.

506 Marketing Strategy (3) Integration of concepts and analytical skills from each component area of marketing to formulate cohesive, well-organized marketing program. Prereq: 501.

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

593 Independent Study (3) Directed research and study. Prereq: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.

599 Special Topics Seminar (3) Topics vary; nonbusiness marketing applications, macroenvironmental issues, market segmentation, international marketing, services marketing, marketing channels, related issues. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

601 Marketing Theory (3) Nature and scope of marketing and of theories of prediction and theory testing important to marketing research.

602 Research Methods I (3) Research process: problem formulation, research and experimental design, measurement and implementation of results. Design, experimental design, survey research, and measurement.

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

604 Seminar in Buyer Behavior Research (3) Behavioral study of people in their roles as buyers and users of goods and services both individual and group processes.

605 Research Methods II (3) Analytical approach to marketing decisions and role of quantitative methods. Models and model building in marketing consideration of decision theory, linear programming, simulation and other mathematical representations of marketing phenomena.

606 Special Topics (3) Topics vary: marketing strategy, advanced consumer behavior, influence and persuasion theory and strategy, pricing issues, international marketing issues, and nonprofit organization marketing issues.

Logistics and Transportation

Professors:

Davis, F. W., Jr., Ph.D. Michigan State
Dier, Gary N., DBA Indiana
Frye, J. L. (Emeritus), Ph.D. Florida
Hendrix, F. L. (Emeritus), Ph.D. North Carolina
Langley, C. J., Jr., Ph.D. Penn State
Materials Science and Engineering

(College of Engineering)

MAJORS

Metallurgical Engineering

Polymer Engineering

Joseph E. Spruiell, Head

ASSOCIATE PROFESSORS:

Ashbee, K. H. G. (Rachelle Chair of Excellence), Ph.D. Delaware

Bogue, Donald C., Ph.D. Birmingham (UK)

Borie, Bernard S., Ph.D. MIT

Brooks, C. R., Ph.D. Tennessee

Buchanan, Raymond A., Ph.D. Vanderbilt

Clark, E. W. (Eng and Pr. Ph. D. Both the metallurgical and polymer programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult with the appropriate faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

Areas of concentration within the metallurgical engineering program include:

- Physical metallurgy
- Materials processing
- Welding science
- Failure analysis
- Mechanical and physical behavior of materials
- Specializations in electronic and ceramic materials are available.

Areas of concentration within the polymer engineering program include:

- Rheology and polymer processing
- Polymer morphology
- Mechanical, physical, and chemical behavior of polymers and composite materials.

THE DOCTORAL PROGRAM

Thesis Option

A total of 30 semester hours is required for the M.S. degree in either Metallurgical Engineering or Polymer Engineering. Additional requirements include:

1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering or polymer engineering. The polymer engineering major must include the following courses:

- 540, 541, 542, 543, 549, 550, and 572 unless similar material has been covered in prior coursework.
- Additional courses amounting to 6 to 12 hours totaling 6 to 12 hours in any approved engineering field, or other related fields.

2. Master's thesis, consisting of 6 to 12 hours. All resident students are required to register for and participate in the graduate seminar in metallurgical engineering or polymer engineering, as appropriate, during each semester in which it is offered. Credits for the seminar are not counted towards satisfying the coursework requirements.

Non-Thesis Option

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

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

3. Satisfactory performance in an oral examination to be conducted by the faculty committee. The review will include a critical review of the literature in an area related to metallurgical or polymer science or materials science (580).

4. Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Areas of concentration within the polymer engineering program include:

- Rheology and polymer processing
- Polymer morphology
- Mechanical, physical, and chemical behavior of polymers and composite materials.

1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering or polymer engineering. The polymer engineering major must include the following courses:

- 540, 541, 542, 543, 549, 550, and 572 unless similar material has been covered in prior coursework.
- Additional courses amounting to 6 to 12 hours totaling 6 to 12 hours in any approved engineering field, or other related fields.

2. Master's thesis, consisting of 6 to 12 hours. All resident students are required to register for and participate in the graduate seminar in metallurgical engineering or polymer engineering, as appropriate, during each semester in which it is offered. Credits for the seminar are not counted towards satisfying the coursework requirements.

Non-Thesis Option

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

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

3. Satisfactory performance in an oral examination to be conducted by the faculty committee. The review will cover a critical review of the literature in an area related to metallurgical or polymer science or materials science (580).

4. Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Areas of concentration within the polymer engineering program include:

- Rheology and polymer processing
- Polymer morphology
- Mechanical, physical, and chemical behavior of polymers and composite materials.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 503 or 504 every semester offered.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residency of students in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Metallurgical Engineering is available to residents of the state of Virginia; the M.S. and Ph.D. programs in Polymer Engineering are available to residents of Arkansas, Kentucky, Louisiana, Texas, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

405 Structural Characterization of Materials (4) Ray diffuse scattering and transmission electron microscopy; microanalytical techniques.

421 Mechanical Behavior of Materials II (3) Description of stress and strain; linear elastic constitutive equations; yield criteria; brittle fracture; crazing; plastic strain constitutive equations, forming operations and limit criteria. Prereq: Mechanical Behavior of Materials, Mechanics of Materials I, sophomore mathematics.

422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metallurgical processing. Ferris and nonferrous pyrometallurgical refining, slag-metal equilibria, solidification, gas-metal processing. Prereq: 303. Sp

425 Metallurgical Applications in Manufacturing and Processing (3) Fabrication methods, standards and specifications. Thermomechanical processing for finished and semifinished products; casting, forming, joining, heat treatment, powder metallurgy, corrosion control. Prereq: 201.

426 Materials Joining (3) Processes for joining metals, polymers and ceramics: mechanical, adhesive, fusion-solidification/crystallization; surface characteristics necessary for joining and chemical bonding; thermal effects on structure and properties of joints; design of joints. Prereq: Introduction to Materials Science and Engineering.

443 Polymer Processing (3) Rheological measurements; flow through tubes and slits, end effects and extrude swell; selected application, screw extrusion, injection molding, synthetic fibers in various materials; yield criteria; brittle fracture; crazing; plastic strain constitutive equations, forming operations and limit criteria. Prereq: Mechanical Behavior of Materials, Mechanics of Materials I, sophomore mathematics.


472 Fundamental Principles of Composite Materials (3) Establishment of physical principles basic to design, manufacture and application of fiber reinforced polymers, metals and ceramics. Prereq: 302 or equivalent.

474 Biomaterials (3) Metals, polymers and ceramics used in implantation, cardiovascular, and dental surgery implant devices; corrosion and degradation problems; material properties of primary importance; tissue responses. Prereq: 201. Recommended for engineering science and mechanics majors.

475 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 423.)

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

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

503 Graduate Seminar in Metallurgical Engineering (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

504 Graduate Seminar in Polymer Engineering (1) Prereq: Admission to graduate program. May be repeated. S/NC only. E

505 Engineering Analysis (3) (Same as Chemical Engineering 505.)

522 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 421 or consent of instructor.

523 Plastic Deformation of Metals (3) Geometry and mechanisms of single crystal plastic deformation; slip, twinning, 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. Prerequisites: 301, 320 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: formation, transformation, processing, melting, treatment, 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, cooling cracking and porosity formation; applications to process utilization.

529 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion equations; random walk problem and mechanisms of diffusion; diffusion in dilute and concentrated alloys; Kirkendall effect; high diffusivity paths.

530 Phase Transformations in Metallic Materials (3) Thermodynamics of phase equilibria, theory of nucleation in solids; kinetics and morphology of diffusion controlled growth; kinetics of interface controlled phase transformation; crystallography and kinetics of martensitic transformations.

531 Advanced Corrosion (3) Analyses of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: 470 or consent of instructor.


540 Basic Polymer Chemistry (3) Synthesis, reactions and degradation of polymers. Molecular characterization; solution methods and spectroscopy. Prereq: Semester of organic chemistry and thermodynamics.

541 Fluid Mechanics and Polymer Processing (3) Navier-Stokes equations and illustrative problems; applications in chemical engineering and polymer engineering; measurement, instruments; multivariable systems. Basic concepts in rheology; applications in polymer processing; screw extrusion, fiber spinning, injection molding, solution molding. Prereq: 541. E

542 Further Topics in Polymer Processing (3) Description and analysis of selected polymer processing operations. Prereq: 541.

543 Basic Polymer Physics (3) Essential structure and properties of polymers, Mechanical, electrical and thermal properties. Coreq: 540.

544 Polymer Solution Thermodynamics and Characterization (3) Theory of solutions, statistical thermodynamics, polymer solutions, intramolecular and intermolecular forces, characterization of polymers. Prereq: Undergraduate physical chemistry.

545 Physical Characterization of Polymers (3) Fracture-safe design, loading and fatigue testing, electron microscopy.

546 Mechanical Properties of Solid Polymers (3) Typical mechanical behavior, Hooker, linear and nonlinear elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss spectrum. Prereq: Introduction to mechanical properties of polymeric composites.

549-50 Laboratory Methods in Polymer Engineering (1,1) Basic experimental techniques and instrumentation associated with characterization, x-ray and light scattering, calorimetry, optical and mechanical properties of solid polymers, polymer processing operations. Coreq: 540 or consent of instructor.

550 Principles of Ceramic Processing (3) Treatment of ceramic processing: raw materials preparation and characterization; powder consolidation; drying, firing, sintering techniques, mechanisms and kinetics. Prereq: 360 or equivalent.

551 Inorganic Glass Forming Systems (3) Physical and chemical nature of inorganic glasses; structural theories of glass formation; major glass forming systems: silica, oxide oxide glasses, nitrate glasses, water glasses, and chalogenide glasses. Prereq: 360, Chemistry 371.

570 Chemical Thermodynamics (3) Entropy and entropy of mixing. Gibbs function and chemical potential methods; measurement of entropies of mixing; heat capacity of liquids, gases and solids; calculation of phase diagrams. Prereq: 330 or equivalent.

571 Electron Microscopy (3) Operation of electron microscopes; kinematic and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 304 or equivalent.

572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of corrosion. Application to inorganic, metallic and polymer structures.

573 Biomaterials Analysis and Development (3) Physical property limitations of current surgical implant materials and methods of improvement; resistance to corrosion and mechanical damage; detrimental effects of specific metal ions; development of new biomaterials and new materials processing techniques. Prereq: 470, 474 or consent of instructor.

574 Formability of Materials (3) Modeling and analysis of finite plastic strain with application to primary and secondary forming operations: crystalline and noncrystalline materials. Failure mechanisms; instability, predictive testing. Prereq: Consent of instructor.

576-77 Special Topics in Materials Science and Engineering (3,3) Topics of current significance and interest. Prereq: Consent of instructor. May not be repeated.


600 Doctoral Research and Dissertation (3-15) S/NC only. E

621-22 Theoretical Metallurgy (3,3) Topics in solid state physics as applied to metalurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation. Prereq: Consent of instructor.

623-24 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, magnetohydrodynamics of incompressible fluids, growth stability theory, thermodynamic applications, rapid solidification theory, metastability. Prereq: Consent of instructor.

641 Advanced Rheology and Viscoelastic Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing various flows. Many applications to inorganic materials. Application to polymer processing problems. Recommended for MSE candidates working in rheological area.

642 Advanced Topics in Polymer Processing (3) Application of theories of rheological behavior and of
structure development to analysis of polymer processing operations. Prereq: 541. (Same as Chemical Engineering 642.)

643 Phase Transformations in Polymers (3) Glass transition; vitrification; annealing of polymeric glasses; crystallization of copolymers; crystallization under stress. Pre-req: 543.

671 Quantitative Microscopy (3) Principal acoustic, optical, x-ray electron, electron and field-ion techniques for examination of microstructures of materials. Prereq: 472.


676-77 Advanced Topics in Materials Science and Engineering (3,3) Latest developments and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

679-70 Seminar in Recent Advances in Materials Science and Engineering (3,3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.

Mathematics

(College of Liberal Arts)

MAJOR DEGREES

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

John B. Conway, Head

Professors:

Albert, G. E. (Emeritus), Ph.D. ............... Wisconsin
Alexiades, V., Ph.D. ............................... Delaware
Aliakos, N., Ph.D. ................................. Brown
Anderson, D. F., Ph.D. ......................... Chicago
Baker, G. A., Ph.D. ............................... Cornell
Bradley, John S., Ph.D. ......................... Iowa
Caruth, J. H., Ph.D. ............................. Louisiana State
Clark, C. E., Ph.D. ............................... Louisiana State
Conway, J. B., Ph.D. ............................. Louisiana State
Daveyman, Robert J., Ph.D. .................... Wisconsin
Desartt, Donald J., Ph.D. ....................... Maryland
Dobbs, D. E., Ph.D. .............................. Cornell
Dydk, J. Ph.D. ............................... Warsaw
Eaves, E. D. (Emeritus), Ph.D. ................. Texas
Frandsen, Henry, Ph.D. ........................ Illinois
Hallam, T. G., Ph.D. ............................. Missouri
Hinton, D. B., Ph.D. .............................. Tennessee
Householder, A. S. (Emeritus), Ph.D. ....... Chicago
Husch, L. S., Ph.D. ............................... Florida State
Johansson, K., Ph.D. ............................. Bielefeld
Jordan, G. Samuel, Ph.D. ....................... Wisconsin
Kuperoshid, B. A. (UTSI), Ph.D. ............. MIT
McConnel, R. M., Ph.D. ........................... Duke
Mathews, H. T., Ph.D. ............................ Tulane
Miller, D. E. (Emeritus), Ph.D. ............... Michigan
Rajput, B. S., Ph.D. ............................. Illinois
Reddy, K. C. (UTSI), Ph.D. ..................... Indian IT
Schaear, P. W., Ph.D. ............................ Maryland
Serbin, Steve, Ph.D. ............................. Cornell
Soni, K., Ph.D. ................................. Oregon State
Stallman, F. W. (Emeritus), Ph.D. .......... Giessen
Stephenson, K. R., Ph.D. ........................ Wisconsin
Wachspex, E. Ph.D. ............................. Rensselaer
Wade, W. R., Ph.D. ............................. California (Riverside)
Wagner, C. G., Ph.D. ............................ Duke

Associate Professors:

Gross, L. J., Ph.D. ............................... Cornell
Karakashian, O., Ph.D. ........................... Harvard
Kimble, K. R. (UTSI), Ph.D. .................... Ohio State
Kuo, Y., Ph.D. ................................. Cincinnati
Lenharr, S., Ph.D. ............................... Kentucke
Miley, S., Ph.D. ................................. Purdue
Rosinski, J., Ph.D. ............................... Wroclaw
Row, W. H., Jr., Ph.D. ........................... Wisconsin
Simpson, H., Ph.D. .............................. Cal Tech
Smith, J., Ph.D. ................................. California
Soni, R. P., Ph.D. ............................... Oregon State
Sundberg, C., Ph.D. .............................. Wisconsin
Thistletwalle, M. B., Ph.D. ..................... Manchester

Assistant Professors:

Fitzpatrick, B., Ph.D. ........................... Brown
Jank, T., Ph.D. ................................. Warsaw Tech
Oberhoit, M., Ph.D. ............................. Michigan
Richter, Stefan, Ph.D. ........................... Michigan
Swirsky, R., Ph.D. .............................. Johns Hopkins

The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers; (2) the Master of Science degree, designed to prepare students for industrial employment and for teaching, and (3) the Doctor of Philosophy degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

A student offering mathematics as a minor for the Master's degree is required to obtain at least 6 hours of resident graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

THE DOCTORAL PROGRAM

For the Ph.D. in Mathematics, the student must meet the following four requirements in addition to those of The Graduate School:

1. Satisfy either of the following: the standard program or the mathematical ecology concentration. A student intending to work in mathematical ecology may complete either, but he/she is encouraged to complete the mathematical ecology concentration. A student may elect to switch from one to the other provided the constraints of the latter option have not been violated. A student's status at election therefore is determined by the complete history of his/her earlier examinations from the standard program and part 1 of the mathematical ecology concentration. A description of both programs is below.

2. Demonstrate proficiency in one foreign language, normally French, German or Russian. This requirement is to be met prior to the examination in the area of specialization. The student's doctoral committee may require that the student pass a second language exam.

3. Pass an examination in the field of specialization. This examination will be given by a committee appointed by the department head at some time after the requirements in 1. have been met. A student may take this specialty examination only twice.

4. Take a one-year, 600-level sequence in mathematics outside of his/her area of specialization. The use of the course selected to fulfill this requirement must be approved by the department head and the student's doctoral committee (approval may occur after completion of the course).

THE MASTER OF MATHEMATICS PROGRAM

Before admission to the Master of Mathematics program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of elementary or secondary school teaching experience. A student offering mathematics as a minor for the Master's degree is required to obtain at least 6 hours of resident graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

THE MASTER OF 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 out-
Students selecting only three from the above list will also be required to pass a written exam on an area of applied mathematics (e.g., fluids, elasticity, mathematical ecology) approved as an examination topic for that student by the Graduate Committee and the Applied Mathematics Committee. This Graduate Committee will appoint a section of faculty who will submit a list of topics and references to the Graduate Committee and the Applied Mathematics Committee for approval.

Students may take as many of the written examinations as desired at any time these exams are given, subject to the following conditions:

1. The exams to be taken must be approved in advance by the student's advisory committee.
2. At most, 4 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. Students may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of examinations.

Mathematical Ecology Concentration

Students must pass examinations in two areas:

1. Three subjects in mathematics. One must be mathematical ecology and two must be from the list under the standard program. Students may not count passes on examinations in both d. and e., fnf. and g., nor in i. and j. toward the required three passes. At least one exam must be chosen from a. through e.
2. Two biology, covering material selected from nine hours of coursework outside of mathematics at the 500 level or above.

The courses submitted for examination must be approved by the student's doctoral committee and the departmental Graduate Committee. The exam is to be prepared, administered, and graded by instructors of the courses involved, along with at least one member of the mathematical ecology section. The student must obtain written agreement to participate in the examination from instructors of these courses and from at least one member of the mathematical ecology section before submitting materials to the committees for approval.

GROADE COURSES

400 History of Mathematics (3) Development of major ideas in mathematics section to modern times and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course: at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Calculus.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts in various areas of mathematics. Does not satisfy the major requirements for a B.S. or M.S. in mathematics. Prereq: 141 plus 1 semester of discrete mathematics. 221 or 504.

404 Applied Vector Calculus (3) Topics from multivariable and vector calculus: line and surface integrals, divergence theorem and theorems of Gauss and Stokes. Prereq: 241.

405 Models in Biology (3) Difference and differential equation models of biological systems. Prereq: 141-42 or 151-52.


421 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures: sequences, partitions, graphs, finite fields and geometries, or experimental designs. Prereq: 323 or consent of instructor.


425 Statistics (3) Derivation of standard statistical distributions: t, F and X2, independence of random variables, basic limit theorems; point and interval estimation. Bayesian estimates; statistical hypotheses, Neyman-Pearson theorem; likelihood ratio and other parametric and non-parametric tests; sufficient statistics. Prereq: 323.


444 Complex Variables II (3) Applications of complex variables to steady-state temperatures, electrostatics, and fluid flow. Prereq: 443.

445-46 Advanced Calculus III (3,3) Theory of sequences, series, and uniform convergence; integrations of functions of one or more variables. Prereq: 341 or consent of instructor.

447-48 Honors: Advanced Calculus III, (3,3) Honors version of above. Prereq: 341 or consent of instructor.

451 Topics in Algebra (3) Number theory and theory of polynomial equations such as quadratic reciprocity law and Sturm separation. Prereq: 351.


455-56 Abstract Algebra III (3,3) Algebraic structures: groups, rings, fields, vector spaces and linear transformations. Prereq: 351 or consent of instructor.

457-58 Honors: Abstract Algebra III (3,3) Honors version of above. Prereq: 455-56. Prereq: 351 or consent of instructor.

460 Geometry (3) Axiomatic and historical development of Euclidean, Neutral, and hyperbolic geometry; proof techniques and critical reasoning. Models of non-Euclidean geometries. Prereq: Calculus and Discrete Mathematics, or consent of instructor.

461 Topology (3) Topology of line and plane, separation properties of sets, continuous functions, homeomorphisms, and topological invariants. Prereq: 341 or consent of instructor.


470 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study or special faculty guidance. Prereq: Consent of the faculty mentor to supervise independent work. May be repeated. Maximum 9 hrs.

479 Seminar in Mathematics (1-3) Topics vary. Requires oral-class presentations and term papers by students. Credit hours announced for each seminar. Prereq: Consent of instructor. May be repeated. Maximum 5 hrs.

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

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

503 MBA Calculus (3) Review of derivatives and antiderivatives; exponential functions, functions of two variables, polar coordinates; applications of integrals. Prereq: Calculus is open only to satisfy MBA core requirements. Prereq: 121.

504 Discrete Mathematics for Teachers (3) Mathematical logic and methods of argument, sets, functions and relations, combinatorics. Normally first graduate course for students seeking M.M. degree. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent.

505 Analysis for Teachers (3) Development of differential and integral calculus, proofs of basic theorems. 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: Calculus I; may be repeated. S/NC only.

506 Algebra for Teachers (3) Algebraic structures: integral domains and fields and their applications to algebra of integers and polynomials. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus or equivalent, and 504.


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.


513-14 Mathematical Principles of Fluid Mechanics (3,3) Equations of motion, incompressible and compressible potential flow, shock waves, viscous flows, Navier-Stokes equations. Prereq: 431, 435, and 446-44 or 404, or consent of instructor.

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.

522-22 Applied Combinatorics (3,3) Application of discrete differences, generating functions, and recurrence relations to enumeration problems. Coding theory, experimental design, graph theory, or decision theory.

523-24 Probability (3,3) Particular laws from measure theory, axiomatic probability, independence; Kolmogorov's existence theorem; series of independent
507 Stochastic Modeling (3) Models in probability applied to real world situations; queuing theory; branching processes. Monte Carlo simulation. Prereq: 445-46 or consent of instructor.


535-36 Partial Differential Equations (3,3) First order equations, classification of equations and properties of elliptic, hyperbolic, and parabolic equations in several variables. Prereq: 445-46 and 431 or consent of instructor.

539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


549 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

550 Matrix Algebra (3) Advanced topics in matrix theory; decomposition theorems and applications to matrices with special structure. Prereq: 453 or consent of instructor.

551-52 Modern Algebra (3,3) Groups, rings, modules, and linear algebra, fields and Galois theory. Must be taken in sequence. Prereq: 455-56 or 431 or consent of instructor.

553 Linear Programming (3) Theory and applications. Prereq: Consent of instructor or 450 and programming 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; metrization; homeomorphic invariants of point sets. Mappings and homotopies. Covering spaces and fundamental group.

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 computer architectures. Prereq: 453,471-72, or consent of instructor. May be repeated. Maximum 8 hrs. (Same as Computer Science 575.)

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.

583 Mathematical Evolutionary Theory (3) Population genetics and evolutionary theory. Prereq: 431, 453 or consent of instructor.

584 Mathematical Systems Theory (3) Analytic approach to discrete and continuous dynamical control systems; optimal control. Applications to ecology. Prereq: 431, 453, 445-46 or consent of instructor.

585 Optimal Control Theory (3) Deterministic optimal control, Pontryagin maximum principle, calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. Prereq: 445-46 or consent of instructor.

589 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

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

598 Graduate Reading in Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

599 Graduate Reading in Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

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

617-18 Lie Algebras in Mechanics and Physics (3,3) Analytical tools of mechanics and physics arising from differential manifolds, tensors, Lie derivatives, Lie groups, differential forms, Lie algebras, applications to Hamiltonian mechanics, adiabatic and barotropic fluids and plasmas, numerical methods in continuum mechanics. Prereq: 431, 453, 455, 571-72. (Same as Physics 617-18.)

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

623-24 Advanced Probability (3,3) Selected topics in modern probability theory, stochastic processes. Itô's calculus and stochastic differential equations, integration prediction 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.

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.

639-36 Advanced Partial Differential Equations (3,3) Selected topics in classical and modern theoretical partial differential equations. Prereq: 541-42 or 547-48 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


643-44 Harmonic Analysis (3,3) Fourier series and Fourier transforms on Euclidean spaces or topological groups; convergence, summability, uniqueness, inversion, duality, Plancherel transform, Hilbert transform, Hardy-Littlewood maximal function, interpolation of operators, or Fefferman-Stein duality. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 551-52 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


653-64 Algebraic Topology (3,3) Homology, homotopy and homology theories: duality theorems and Hurewicz isomorphism theorem. Prereq: 561-62 and 1 yr of abstract algebra, 455-56 or 551-52. May be repeated with consent of department. Maximum 12 hrs.

655-66 Topological Algebra (3,3) Topological semigroups, topological groups, Lie groups, transformation groups, topological lattices, relations in topological spaces; topological rings, fields, algebras. Prereq or coreq: 561-52. May be repeated with consent of department. Maximum 12 hrs.

569 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.
Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options are available.

**Thesis Option**

The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 24 semester hours of coursework that includes at least 14 semester hours of graduate (500-level or above) courses in the discipline and normally 6 semester hours of coursework (400-level or above) in mathematics.

2. Six semester hours of thesis.

3. Participation in the departmental seminar program.

4. Submission and defense of a written thesis that demonstrates the ability to conduct and report on an independent investigation.

5. Passing a final examination on all work submitted for the degree.

**Course Option**

This option is restricted to those students who have had the equivalent of a thesis experience. The evaluation of the work experience and oral final selection of the student’s program of study are left to the student’s committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 30 semester hours of coursework that includes at least 18 semester hours of graduate (500-level or above) courses in the discipline and normally 6 semester hours of coursework (400-level or above) in mathematics. No more than 3 semester hours of engineering coursework may be below the 500 level.

2. Participation in the departmental seminar program.

3. Passing a comprehensive written and oral final examination on all coursework submitted for the degree. The student’s committee will be of sufficient size to include all of the study areas reflected in the course program.

**Problems Option**

The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 24 semester hours of coursework that includes at least 12 semester hours of graduate (500-level or above) courses in the discipline and normally 6 semester hours of coursework (400-level or above) in mathematics.

2. A minimum of 6 semester hours in 990 Selected Engineering Problems. A written report must be prepared for each problem investigated.

3. Participation in the departmental seminar program.

4. Passing a comprehensive written final examination on all coursework submitted for the degree and an oral examination on all work (including problems).

**THE DOCTORAL PROGRAM**

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The student must satisfactorily complete an approved program of study that includes a minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:

1. Twenty-four semester hours in doctoral dissertation.

2. 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.

3. A minimum of 24 semester hours in the discipline in courses numbered 500 and above, with at least 9 semester hours of 600-level courses. These are exclusive of thesis, problems, or dissertation credit. The student's advisory committee can approve a student's petition to replace one 600-level course with one or more 500-level courses that are more appropriate.

4. Participation in the departmental seminar program.

5. The passing of a written and oral comprehensive examination is required as well as a successful defense of the dissertation.

**ACADEMIC COMMON MARKET**

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

**GRADUATE CREDIT FOR UNDERGRADUATE COURSES**

Senior (400-level) mechanical and aerospace engineering courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors. If approved by the student's major department, mechanical or aerospace engineering majors may not normally use more than one 400-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

**Mechanical Engineering**

**GRADUATE COURSES**

- **416 Turbo-Machinery (3)** Basic principles of turbo-machinery; systematic methods of analysis, design, performance, evaluation. Prereq: Aerospace Engineering 351.
- **422 Environmental Noise (3)** Basic principles of acoustics; measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.

**Graduate programs in Mechanical Engineering** are available to those applicants who have demonstrated superior achievement in their engineering backgrounds. The student must satisfactorily complete an approved program of study that includes a minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including: 1. Twenty-four semester hours in doctoral dissertation. 2. 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. 3. A minimum of 24 semester hours in the discipline in courses numbered 500 and above, with at least 9 semester hours of 600-level courses. These are exclusive of thesis, problems, or dissertation credit. The student's advisory committee can approve a student's petition to replace one 600-level course with one or more 500-level courses that are more appropriate. 4. Participation in the departmental seminar program. 5. The passing of a written and oral comprehensive examination is required as well as a successful defense of the dissertation.  

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GRADUATE CREDIT FOR UNDERGRADUATE COURSES

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Mechanical Engineering

GRADUATE COURSES

- **416 Turbo-Machinery (3)** Basic principles of turbo-machinery; systematic methods of analysis, design, performance, evaluation. Prereq: Aerospace Engineering 351.  
- **422 Environmental Noise (3)** Basic principles of acoustics; measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.
445 Lubrication (3) Hydrodynamic theory of lubrication of sliding bearings; application of Navier-Stokes equation to lubricant flow and pressures; analysis of lubrication solutions; applications to design. Prereq: 344, Aerospace Engineering 351.

449 Mechanical Engineering Laboratory (3) Design, conducting and reporting results of experimental equipment to determine inherent characteristics and limitations of data. Analysis of data and formation of conclusions. Prereq: 332, 344, 345. Coreq: 475. 3 labs. F,Sp


455 Introduction to Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering solid mechanics system. Participation in team design engineering project. Prereq: Knowledge of equations of motions. Elements of Design. F.

456 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability, design of mechanical engineering solid mechanics system. Participation in team design engineering project. Prereq: Design project report. Prereq: 332, 344. F

461 Computer Integrated Manufacturing (3) Application of computers to control of machine tools, robots, and computer integrated systems. Programming languages and computer-aided part programming. Dimensioning and metrology. Prereq: 266 or Industrial Engineering 404. Basic Engineering 201. F

462 Tool Design (3) Principles underlying tool and die design; design for high volume production; work holding fixtures; comparison of material removal methods; selection of cutting tool; plastic forming. Prereq: 366 or Industrial Engineering 404. Engineering Science and Mechanics 321.


468 Machine Design (4) Design of complete machines; design of internal combustion engines; hydraulic and pneumatic systems, working drawings, and cost analysis. Written and oral report. Prereq: 455, 466. Sp

471 Refrigeration and Air Conditioning (3) Vapor compression systems; refrigeration equipment; psychrometric processes; air washers; cooling towers; solar radiation; building heat transmission. Prereq: 341. F

474 Solar Energy Utilization (3) Nature and availability of solar radiation; review of selected heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storage; selected applications. Prereq: 332, 344, or consent of instructor.

475 Thermal Engineering (3) Thermal systems, thermal machinery, 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

481 Internal Combustion Engines (3) Thermochemical phenomena in combustion and propulsion engines. Combustion, detonation; equilibrium, dissociation. Analysis of internal combustion engines using idealized flows. Prereq: 332. 4-6 hrs.

494-95 Selected Topics in Mechanical Engineering (1-4,1-4) Problems and topics related to developments and practice in mechanical engineering. Prereq: Consent of instructor.

500 Thesis (1-15) PiNP 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 University personnel time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

507 Application of Numerical Linear Algebra in Systems and Control Engineering I (3) Same as Chemical Engineering 507 and Electrical and Computer Engineering 507.


514 Phase Change Heat Transfer (3) Mechanics and modeling of phase changes. Evaporation and film boiling processes; critical heat flux; forced convection boiling and pool dry-out heat transfer; condensation processes; heterogeneous and homogeneous condensation; subcooled and two-phase condensation; flow condensation; liquid-solid phase change processes; moving phase fronts; mathematical modeling. Prereq: Heat Transfer.

521-22 Thermodynamics I and II (3,3) Macroscopic thermodynamics, including First and Second Law analyses, availability, phase change and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectroscopic data, kinetic theory, statistical mechanics and quantum physics, Schrodinger equation. Prereq: 332.

523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instructor.

525 Combustion and Chemically Reacting Flows I (3) Fundamentals: thermochemistry, chemical kinetics and conservation equations; phenomenological approaches to laminar flames; diffusion and premixed flame theory; single droplet combustion; deflagration and detonation theory; stabilization of combustion waves in laminar streams; Flamelet stability limits of premixed laminar flames; introduction to turbulent flames. Prereq: 522, 531.

526 Combustion and Chemically Reacting Flows II (3) Advanced theory of premixed and non-premixed turbulent flames; fundamentals of turbulent flow; application of probability density functions to turbulent flames; turbulent reacting flows with premixed and/or non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustion; furnaces; introduction to supersonic combustion and hypersonic flows. Prereq: 525.


541-42 Research in Mechanical Engineering I and II (3,3) Design of experiments; data analysis; experimental investigation. Prereq: Consent of instructor.

551-52 Mechanical Engineering Design (3,3) Design of mechanical systems and devices. Prereq: Consent of instructor.

553 Development of Superior Products and Processes (3) Case studies of latest techniques of superior product development and process development practiced in industry. Case study of product or process yielding superior results developed by student. Prereq: B.S. in Engineering Science and Mechanics 589, and Electrical and Computer Engineering 589.


560 Computer Aided Mechanical Design (3) Application of techniques and computer-aided design techniques in static and dynamic analysis and re-design of complex, three-dimensional, statically indeterminate structures. Prereq: 569, Consent of instructor.

581 Experimental Stress Analysis (3) Experimental stress analysis, photoelasticity, strain gauges. Prereq: Consent of instructor.

587-68 Dynamics of Machinery (3,3) Kinematics and dynamics of geared, chain, and rotating co-ordinate systems; linear and angular momentum; energy methods; computational techniques derived from Lagrangian mechanics; variable mass, rigid body dynamics. Prereq: 303, 391.

596 Vibrations (3) Free and forced vibration of single and multiple degree systems. Time dependent and nonlinear. Prereq: Undergraduate vibrations course.


581 Rocket Propulsion I (3) Rocket propulsion fundamentals; thermodynamics of nonreacting and chemically reacting ideal gas and real gas rocket engines; rocket performance parameters; 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 propel- lant burn rates, erosive burning; analysis of heavy phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion; electrical resistance and electric field ion) engine performance, magneto-hydrodynamic thrusters, traveling wave thrusters, exotic propulsion systems. Prereq: Consent of instructor.

584-85 Turbomachinery Systems I, II (3,3) Ideal cycle analysis of turbine engines, real cycle analysis, component performance and design, effects of operational conditions, turbine system integration (inlets, nozzles, combustors, compressors, turbines), flow theory, engine control, performance, turbine operation, surge and rotating stall, engine control systems, structural considerations. Prereq: First year graduate standing and consent of instructor.


598 Measurement Science II (3) Same as Nuclear Engineering 588, Chemical Engineering 586, Civil Engineering 586, Electrical and Computer Engineering 586, Engineering Science and Mechanics 588, and Aerospace Engineering 588.

590 Selected Engineering Problems (2-6) Enrolment limited to students in programs program. Prereq: Consent of advisor. May be repeated. S/NC only.

595 Seminar (1) All phases of mechanical engineering, reports on current research at UKT. May be repeated. S/NC only.

599 Special Topics in Mechanical Engineering (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
Aerospace Engineering

GRADUATE COURSES


423 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods. Prereq: 422 or Heat Transfer or consent of instructor. Sp

424 Astronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems. Prereq: 362, Mechanical Engineering 332. Sp

425 Propulsion (3) Principles of propulsion devices; turbojet, ramjet and rocket engines. Prereq: 351. F

426 Introduction to Aerospace Design (2) Design process, synthesis, safety, reliability, patients, product liability, economic analysis, optimization, design standards, design studies. Individual design reports. Prereq: 351, 370, 363. Coreq: Mechanical Engineering 344. F

429 Aerospace System Design (4) Synthesis and design of complete aerospace system, economic and technical aspects. Participation in team design effort, for program presentations and design report. Prereq: 425, 426. Sp

449 Aerospace Engineering Laboratory (3) Design, conducting, and reporting results of experiments, with emphasis on techniques and methodologies. Analysis of data and formation of conclusions. Prereq: 345, 351. 3 labs, F

494-55 Selected Topics in Aerospace Science (1-4) Currently offered in the areas of aerodynamics, flight mechanics and control, propulsion, materials, and space systems. Prereq: Consent of instructor.

500 Thesis (1-6) P/NP only. E

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

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids; plane and axisymmetric flow; potential mapping. Prereq: 422 or Mechanical Engineering 531; Mathematics 425 or equivalent. E

512 Viscous Flow (3) Equations of viscous fluid flow; laminar and turbulent flow; transition; separation; boundary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 531 or equivalent. F

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments: hot wire, anemometry and turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments, boundary layer measurements, laser- optical measurements. Prereq: 423 or Mechanical Engineering 531. F

515-16 Air Vehicle Aerodynamics and Performance (3,3) Application of flow field principles to air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to supersonic speeds. Relations among thrust, drag, lift and attitude in propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 422 for 515; 521 for 516.

521-22 Aerodynamics of Compressible Fluids (3,3) One-dimensional internal and external flow; waves, small perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 422 for 521; 521 for 522.

525 Hypersonic Flow (3) Slender body flow; similarity; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 512.

527-28 Aerospace Ground Test Facilities (3,3) Atmospheric models and similarity considerations; aerodynamic test facilities: continuous and intermittent wind tunnels and ballistic ranges; propulsion test facilities or air breathing and rocket engines; space environment and space vehicle test facilities. Prereq: 512 and 521, Mechanical Engineering 513 and 522.

529 Rarefied Gases Dynamics (3) Binary elastic collisions; kinetic theory; flow regimes; Boltzmann and moment equations; transfer equation, gas-surface interactions; slip boundary conditions, free molecule, slip and transition flow. Prereq: 429. Radiation transfer in thermal and non-thermal physical properties of gas plasmas; governing equations and applications. Prereq: 422 and Mathematics 471.

532 Introduction to Turbulence (3) Macroscopic effects, analogies, statistical treatment, correlation functions, energy spectra, diffusion, application of turbulent jets and pipe flow. Prereq: 511-12.

534 Atmospheric Entry (3) Reentry trajectories; lift and drag during reentry; vehicle motion and stability during reentry; aerodynamic heating protection systems. Prereq: 522. Recommended prereq: 512.

544 Transonic Flow (3) Nature of flow at transonic speeds; small disturbance theory; shock wave properties; shock-free flows; strong viscous interaction phenomena; solution techniques. Prereq: 522.


554-55 Aerospace Vehicle Stability and Control (3,3) Static and dynamic longitudinal directional and stability and control problems in aircraft with free and fixed flight control surfaces. Automatic control systems. Prereq: 423, 551.

561-52 Advanced Aerospace Science (3,3) Aerodynamics, space vehicle design, flight mechanics and control, propulsion systems, control systems, and aeronautics and thermodynamics. Prereq: 522 or 511.

556 Vertical or Short Take Off and Landing Aircraft (4 credits) Fixed wing, tail rotor, wing with tilt and fixed flight control surfaces. Vertical and transition flight modes. High lift airfoils. Automatic control systems. 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.


574 Space Engineering: Satellite Technology (3) Satellite orbits, rocket engines, spacecraft dynamics, computer-aided designing (CAD), computer-aided manufacturing (CAM), spacecraft structure, power systems, attitude control systems, telemetry-tracking/command, and communication systems, spacecraft avionics, and simulations. Prereq: 425, Mechanical Engineering 471, 434.


590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq. Consent of advisor.

595 Seminar (1) All phases of aerospace engineering, reports on current research at UTK. May be repeated. S/NC only.

599 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

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


632 Magneto-hydrodynamics II (3) Alfvén and shock waves, exact solution for magnetohydrodynamic channel flow, one-dimensional model of channel flow, engineering applications of magneto-hydrodynamics, propulsion and power generation. Prereq: 631 and Mathematics 552.

641-42 Physical Gas Dynamics (3,3) High speed, high temperature gas flow from molecular point of view. Kinetic theory, statistical mechanics, equilibrium flow, vibrational and chemical rate processes, non-equilibrium vibrational and chemical flow, non-equilibrium kinetic theory, flow with translational non-equilibrium. Prereq: 522, Mechanical Engineering 522.

645 Theory of Turbulence (3) Same as Engineering Science and Mechanics 645.

651-52 Advanced Aerospace Science (3,3) Subsonic, transonic, supersonic, and high-speed aircraft flows treated in generalized and unified manner with combined viscous/ inviscid effects. Relationships among various regimes of flow. Axi-symmetric flows, outer and inner boundary layers, outer and inner transition, flow instability. Prereq: according to interest of students. Prereq: 511, 522.

Mechanical and Aerospace Engineering 127
Medical Biology

(College of Medicine-Knoxville Unit)

Carmen B. Lozio, Acting Chair

Professors:

Carroll, R., Ph.D. .......... Cornell
Chen, J. P., Ph.D. .......... Penn State
Farkas, W., Ph.D. ........... Duke
Fuhr, J. E., Ph.D. .......... St. John's
Congdon, C. G. (Emeritus), M.D. .......... Michigan
Lang, R. D. (Emeritus), M.D. .......... Washington (St. Louis)
Lozio, Carmen B., M.D. .......... Buenos Aires
McDonald, T. P., Ph.D. .......... Tennessee
Wigler, P. W., Ph.D. .......... Indiana
Wust, Carl J., Ph.D. .......... Indiana

Associate Professors:

Goodman, M. M., Ph.D. .......... Alabama
Hanna, W. T., M.D. .......... Ain-Shams
Ichiki, A. T., Ph.D. .......... UCLA
Schroeder, E. C., D.V.M. .......... Michigan State

Assistant Professors:

Karlstad, M. D., Ph.D. .......... Loyola
Matteson, K., Ph.D. .......... Wisconsin
Potter, N. W., Ph.D. .......... Duke
Switzer, R. C. III, Ph.D. .......... Michigan State
Tyler, J., Ph.D. .......... SUNY Buffalo

The Department of Medical Biology of The University of Tennessee College of Medicine-Knoxville Unit was formed from the faculty of The University Memorial Research Center and Hospital in 1978. The Research Center was established in 1956. The faculty has research, education, and service interests in cancer, blood diseases, metabolism, toxicology, neuroscience, birth defects, cytogenetics, and clinical genetics. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine.

When the faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement with other life science departments at the University.

GRADUATE COURSES

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

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

508 Graduate Research Participation (3) Advanced research techniques while conducting individual biomedical research projects under supervision of faculty. Open to all graduate students. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. S/N only. E

521 Principles of Oncology (3) Lectures, classroom discussion, and case reports surveying major topics of oncology. Prereq: Biology 223-30 or consent of instructor. F,Sp

522 Special Topics in Cancer (1-3) Prereq: 521 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

531 Principles of Hematology (3) Pathophysiology of blood and blood forming systems, Lectures, class discussions and demonstrations. Prereq: Upper division histology and/or cell biology. Zoology 410 and 420.

532 Special Topics in Hematology (1-3) Prereq: 531 and consent of instructor. May be repeated. Maximum 9 hrs.


541 Molecular Basis for Metabolic Disease (4) Disease at molecular level. Changes in molecular events in cells that lead to disease and occur as result of disease. Correlation with clinical and pathological states. Prereq: Biochemistry 410-419 or equivalent. F,Sp

542 Special Topics in Metabolic Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: 541 and consent of instructor. May be repeated. Maximum 9 hrs.

543 Metabolism of Drugs (1) Drug mechanisms of action, membrane transport, enzyme reactions, ionization, stereochernistry and metabolic pathways. For students interested in biochemical pharmacology. Prereq: Biochemistry 310. Sp

545 Clinical Genetics (3) Human genetic disorders: new developments in cytogenetics, molecular genetics, clinical diagnoses and prevention. Prereq: Biology and genetics background or consent of instructor.

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

610 Medical Biology Seminar (1) Invited speakers. Topics posted in advance. May be repeated. S/N only. F,Sp

611 Advanced Topics in Medical Biology (1-3) New developments in biological research applicable to clinical medicine. Primarily for doctoral candidates in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp


Metallurgical Engineering

See Materials Science and Engineering

Microbiology

(Majors of Liberal Arts and College of Veterinary Medicine)

MAJOR

DEGREES

Microbiology .......... M.S., Ph.D.
Veterinary Medicine .......... D.V.M.

Dwayne Savage, Head

Professors:

Beck, Raymond W., Ph.D. .......... Wisconsin
Bocker, Jeffrey M., Ph.D. .......... Cincinnati
Brown, Arthur (Emeritus), Ph.D. .......... Chicago
Montile, T. C., Ph.D. .......... Maryland
Riggsby, W. Stuart, Ph.D. .......... Yale
Rouse, B. T., Ph.D. .......... Georgia
Savage, Dwayne C., Ph.D. .......... California
Sayler, Gary S., Ph.D. .......... Idaho
White, D. C. (Distinguished Scientist), Ph.D. .......... Rockefeller
Woodward, J. M. (Emeritus), Ph.D. .......... Kansas
Wust, Carl J., Ph.D. .......... Indiana

Associate Professors:

Bennett, D. A., Ph.D. .......... Cornell
Moore, R. N., Ph.D. .......... Texas
Stacey, G., Ph.D. .......... Texas

Assistant Professor:

Villafane, Robert J., Ph.D. .......... NYU

Microbiology

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) one 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 two or three 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

Metallurgical Engineering

See Materials Science and Engineering
and concepts, and to facilitate the selection of a research professor. Usually the student selects a research professor toward the end of the laboratory rotation period. The major professor assists in the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

THE MASTER'S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge, to permit the acquisition of technical competence in the fundamentals of research, and to encourage creative and independent thinking. Two to three calendar years are usually needed for the course of study that has the following requirements: (1) 30 hours including 6 thesis credits; (2) a 3.0 GPA in all courses taken in the department; (3) at least five of the subdisciplines recognized by the department: microbial physiology, pathogenic bacteriology, virology, mycology, immunology, microbial genetics, microbiology, molecular biology, and applied microbiology; and (6) 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 system; (2) a 3.0 GPA in all 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) courses in at least five of the sub-disciplines listed in the Master's program; (7) satisfactory performance in a comprehensive examination, which must be passed before admission to candidacy, and (8) the presentation of a research dissertation and its oral defense.

GRADUATE COURSES

410 Bacterial Physiology (3) Modern concepts of structure and function of bacterial cell. Prereq: Introduc tion to Microbiology. F
411 Bacterial Genetics (3) Transmission and expression of genetic information by bacteria. Prereq: Introduction to Microbiology. Sp
420 Medical Microbiology (3) Disease producing microorganisms including bacteria, rickettsia, chlamydia and fungi. Prereq: Introduction to Microbiology. F
429 Medical Microbiology Laboratory (2) Laboratory exercises designed to accompany 420. Prereq: Introduction to Microbiology Laboratory. Coreq: 420. Sp
430 Immunology (3) Principles of inflammation and immunity; immunoglobulin structure and theories of for mation and diversity; complement, hypersensitivities, cell cooperation and recognition in immune mechanisms; soluble factors. Prereq: Biology 220. (Same as Zoology 430). F
439 Immunology Laboratory (1) Laboratory exercises designed to accompany 430. Coreq: 430. (Same as Zoology 439). F
449 Virology Laboratory (1) Laboratory procedures for isolation, handling, and culturing of animal viruses. Prereq: 310. Coreq: 440. 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. Sp
500 Thesis (1-15) F/P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only, E
510 Microbial Physiology (3) Topics in microbial physiology and metabolism. Prereq: 410. Biochemistry 415; or consent of instructor. May be repeated. Maximum 12 hrs. F
520 Pathogenesis of Infectious Disease (3) Topics in pathogenesis: microbial factors and host responses. Prereq: 420, 430, or consent of instructor. May be repeated. Maximum 12 hrs.
530 Immunology and Immunoochemistry (3) Topics in molecular and genetic aspects of immune response, immunobiology, and immunopathobiology. Prereq: 420, 430, or consent of instructor. May be repeated. Maximum 12 hrs.
540 Molecular Virology (3) Topics in replication, assembly, and expression of viruses. Prereq: 440 or consent of instructor. May be repeated. Maximum 12 hrs.
550 Microbial and Molecular Genetics (3) Topics in transmission and expression of genetic information at molecular level. Prereq: 411, Biochemistry 410, or consent of instructor. May be repeated. Maximum 12 hrs.
560 Recombinant DNA (3) Plasmid and bacteriophage molecular biology applied to development of recombinant DNA techniques. Prereq: 411 or consent of instructor.
569 Recombinant DNA Laboratory (3) Practical details and procedures applicable to recombinant DNA methodology and techniques. Prereq or coreq: 560 or consent of instructor.
570 Applied and Environmental Microbiology (3) Topics in applied and environmental microbiology that treat physiology, metabolism, and genetics of microorganisms: fermentations and natural and simulated ecosystems. Prereq: 470 or consent of instructor.
575 Applied Microbiology and Bioengineering (3) (Same as Chemical Engineering 575 and Environmental Engineering 575.)
590 Laboratory Problems (2-4) Laboratory methods for development and interpretation of microbiological research. Prereq: Graduate standing. May be repeated Maximum 6 hrs. S/N only.
591 Foreign Study (1-15) See page 31.
592 Off-Campus Study (1-15) See page 31.
593 Independent Study (1-15) See page 31.
594 Selected Topics in Microbiological Research (2-4) Literature surveys and discussions of selected topics. Prereq: Graduate standing. May be repeated. Maximum 9 hrs. S/N only.
595 General Seminar (1) Lectures and seminars by invited speakers, faculty, and graduate students. May be repeated. Maximum 18 hrs. S/N only, E
596 Laboratory Rotation (1) Familiarization with research areas in department through series of rotations in laboratories of individual faculty members. May be repeated. Maximum 3 hrs. S/N only.
600 Doctoral Research and Dissertation (3-15) F/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/N only. E
602 Journal Club in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/N only. E
603 Journal Club in Immunology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/N only. E
604 Journal Club in Virology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/N only. E
605 Journal Club in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/N only. E
606 Current Topics in Biological Membrane Research (1) (Same as Biochemistry 606.)
610 Advanced Topics in Microbial Physiology (3) Prereq: 510 or consent of instructor. May be repeated. Maximum 12 hrs.
620 Advanced Topics in Microbial Pathogenesis (3) Prereq: 520, 530 or consent of instructor. May be repeated. Maximum 12 hrs.
630 Advanced Topics in Immunology (3) Prereq: 520 or consent of instructor. May be repeated. Maximum 12 hrs.
640 Advanced Topics in Virology (3) Prereq: 440, 540, or consent of instructor. Maximum 12 hrs.
650 Advanced Topics in Microbial and Molecular Genetics (3) Prereq: 550 or consent of instructor. May be repeated. Maximum 12 hrs.
670 Advanced Topics in Environmental Microbiology (3) Prereq: 570 or consent of instructor. May be repeated. Maximum 12 hrs.

Microbiology - Veterinary Medicine

See Veterinary Medicine for program description.

Music

(College of Liberal Arts)

MAJOR DEGREES

Music ........................................... M.M., M.A.

Kenneth A. Keeling, Sr., Head

Professors:

Bitsas, George C., M.M. ............................................ Converse
Brock, John P., M.M. ............................................ Alabactus
Carter, W. J. (Emeritus), D.M.A. ................................ Eastern
Coker, J., M.A. ............................................ Sam Houston
Combs, F. M., M.A. ............................................ Missouri
DeVine, George F. (Emeritus), Diploma ............................................ Schurz
Dorn, W. (Emeritus), M.A. ............................................ Columbia
Fred, Herbert W. (Emeritus), Ph.D. ............................................ North Carolina
Hollford, A. G. (Emeritus), M.M. ............................................ Northwestern
Huber, Calvin R., Ph.D. ............................................ North Carolina
Lennon, J. A., D.M.A. ............................................ Michigan
Keeling, Kenneth A., Sr., D.M.A. ............................................ Catholic
Meacham, John J., M.M. ............................................ Northwestern
Northington, D. B., D.M.A. ............................................ Yale
Pederson, D. M., Ph.D. ............................................ Iowa
Starr, W. J. (Emeritus), M.M. ............................................ Eastern
The Department of Music offers the Master of Music degree with concentrations in accompanying, choral conducting, composition, instrumental conducting, jazz, performance (organ, piano, strings, voice, winds, and percussion), piano pedagogy and literature, sacred music, and vocal chamber music. A thesis is required of students in composition and theory.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements for degrees conferred by UT by Master of Music degree students with concentrations in choral conducting, instrumental conducting, and sacred music. A thesis is required of students in composition and theory.

THE MASTER OF ARTS PROGRAM
A minimum of 33 semester hours, including 18 hours of coursework above the 500 level and 6 hours of thesis, is required for the Master of Arts. Specific curricula are available from the Department of Music. A reading knowledge of French or German must be demonstrated by applicants before being admitted to candidacy.

Music General

GRADUATE COURSES
500 Thesis (1-15) P/NP only. E
501 Graduate Recital (2)
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
511 Lecture Recital (2)
521 Special Topics in Performance (1-3) Prereq: Consent of department head.
561 Church Music Performance Project (1-2) May be repeated. Maximum 3 hrs.

Music History

GRADUATE COURSES
410 Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.
420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools. 1600-present.
430 Symphonic Literature (3) Literature for orchestra from Baroque to present, evolution of symphony.
440 Music of North America (3) Folk and art music of U.S. and Canada from colonial times to present.
450 Composer Seminar (3) Life and works of single composers. 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 areas through selected writings.
490 Church Music Methods and Administration (3)
510 Music Bibliography (2) Bibliographic methodology in music.
520 Music Research (1) Principles of research methodology applied to writing of research proposal and project.
530 Music in the Middle Ages (3) Gregorian and medieval chant, secular monophony, and rise of polyphony.
540 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genres.

560 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.
570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.
580 Music in the Twentieth Century (3) From 1890, Debussy, to present, Stockhausen and others.

Music Instrumental

GRADUATE COURSES
410 Band Arranging (3) Study and application of techniques employed in scoring for marching and concert bands. Prereq: Music Theory 320.
490 Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to conductor's art; musical analysis and practice in conducting. Prereq: Music Education 320 or equivalent.
570 Advanced Suzuki Pedagogy (2) Study of psychology, procedures, and literature utilized by Shinichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.
580 Band Literature (3) Band literature and origins of band. Its important expanded cultivation during past century in United States and Europe.
582 Instrumental Conducting Performance (1) Jury performance; conducting band or orchestra in public.
583 Practicum for Instrumental Conductors (1) Intern experience in choral music. S/NC only.
584 Practicum for Instrumental Conductors (1) Intern experience in field other than area of major interest. S/NC only.
595 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 490 or equivalent.

Music Jazz

GRADUATE COURSES
410 Advanced Improvisation (3) Further development of individual skills and solving individual problems in jazz improvisation. Prereq: 210 and 220.
420 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz, designing and administering jazz programs, and rehearsing techniques for jazz ensembles. Prereq: Studio music and jazz major or consent of instructor.
530 Seminar in Jazz (3) Topic varies.

Music Keyboard

GRADUATE COURSES
410 Early Keyboard Literature (2) Keyboard music through baroque period, music for harpsichord. Prereq: Music History 210-20.
540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

530 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

GRADUATE COURSES

440 Project in Choral Conducting Performance (1-3) Public performance, critical documentation; recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Music Performance

GRADUATE COURSES

All performance courses require an audition and consent of instructor. May be repeated. Maximum 8 hrs toward M.M. degree.

403 Flute (1-4)
405 Oboe (1-4)
410 Bassoon (1-4)
415 Clarinet (1-4)
420 Saxophone (1-4)
425 Horn (1-4)
430 Trumpet (1-4)
435 Trombone (1-4)
440 Baritone (1-4)
445 Tuba (1-4)
450 Percussion (1-4)
455 Voice (1-4)
460 Violin (1-4)
465 Viola (1-4)
470 Cello (1-4)
475 String Bass (1-4)
476 Electric Bass (1-4)
479 Guitar (1-4)
480 Piano (1-4)
485 Harpsichord (1-4)
490 Organ (1-4)
494 Composition (1-3)
495 Composition with Electronic Media (1-3)
496 Composition (1-3)
497 Improvisation (1-4)

501 Woodwind Choir (1) May be repeated.
503 Small Jazz Ensemble (1) May be repeated. Maximum 12 hrs.
504 Jazz Ensemble (1) May be repeated.
505 Studio Orchestra (1) May be repeated. Maximum 12 hrs.
506 Trombone Choir (1) May be repeated.
509 Tuba Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Marimba Choir (1) May be repeated.
512 Baroque Ensemble (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Chamber Music Ensemble (1) May be repeated. Maximum 12 hrs.
520 UT Singers (1) May be repeated.
530 Chamber Singers (1) May be repeated.
532 Collegium (1) May be repeated.
534 Saxophone Choir (1) May be repeated.
540 Opera Theatre (1) May be repeated.
542 Opera Workshop (1) May be repeated.
550 Concert Band (1) May be repeated.
552 Campus Band (1) May be repeated.
554 Varsity Band (1) May be repeated.
556 Laboratory Band (1) May be repeated.
559 Marching Band (1) May be repeated.
570 Symphony Orchestra (1) May be repeated.
580 Concert Choir (1) May be repeated.
582 University Chorus (1) May be repeated.
583 Men's Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Music Ensemble
The Department of Nuclear Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Students may elect a traditional nuclear engineering M.S. or Ph.D. program (focusing on fission energy or fusion energy) or a radiation protection engineering concentration at the Master's level. The radiation protection engineering concentration prepares students for careers in the radiation safety field (health physics). The program is designed for graduates of undergraduate programs in engineering, physics, biology and chemistry.

A joint fusion energy program has been developed between the Nuclear Engineering and the Electrical and Computer Engineering Departments. Cross-listed courses from each department are used to satisfy degree requirements. Students may have the opportunity to do their research at the Fusion Energy Division of Oak Ridge National Laboratory or at the Plasma Science Laboratory, affiliated with the Electrical and Computer Engineering Department. A limited number of Graduate Research Assistantships are available at each location. Further information about this program is available from the department.

Students in the Nuclear Engineering Department have the opportunity to affiliate with the Measurement and Control Engineering Center and the Waste Management Research and Education Institute. These organizations provide unique research opportunities.

THE MASTER'S PROGRAM

A graduate program leading to the Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the undergraduate requirements numbered 400 or above. Students must recognize that at least two-thirds of the minimum required hours (30) in a Master's degree program must be taken in graduate courses numbered 500 and above, exclusive of thesis or dissertation credit.

Students in the Nuclear Engineering Department have an opportunity to affiliate with the Measurement and Control Engineering Center and the Waste Management Research and Education Institute. These organizations provide unique research opportunities.

THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to study for the Doctor of Philosophy must have a Bachelor of Science or Master of Science from a recognized university, with a major in engineering or physics. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, physics, and nuclear engineering. Specific course requirements for the Ph.D. in Nuclear Engineering include:

1. A minimum of 48 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 24 semester hours in doctoral research.
3. A minimum of 30 semester hours in nuclear engineering courses numbered 500 and above (or the equivalent), with at least 9 semester hours of 600-level courses. These are exclusive of the thesis or dissertation research.
4. A minimum of 12 semester hours in mathematics, computer science, or statistics courses beyond nuclear engineering undergraduate requirements numbered 400 or above.

A candidate must successfully defend, in an oral examination on practice school research and all graduate coursework. The student must enroll for sixteen semester hours of NE 598 (Nuclear Engineering Practice).

ACADEMIC COMMON MARKET

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

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

400-level courses in nuclear engineering may be used for graduate credit. However, students must recognize that at least two-thirds of the minimum required hours (30) in a Master's degree program must be taken in courses numbered 500 or above.

GRADUATE COURSES

401 Nuclear Reactor Theory (3) Thermal and fast spectrum computational methods; homogeneous and heterogeneous media. Equations that relate thermal and neutronic variables, power distribution calculations, and reactivity control methods. Prereq: 302.

403 Nuclear Engineering Laboratory (3) Cross-section measurements, critical loading experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and controls experiments. Prereq: 304 or equivalent. Coreq: 401 or 405.


406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

421 Introduction to Nuclear Criticality Safety (3) Fundamentals of nuclear criticality safety; criticality accidents; safety standards; overview of experiments, computational methods, and applications. Prereq: Introduction to nuclear engineering and nuclear reactor theory.

463 Introduction to Fusion Energy I (3) (Same as Electrical and Computer Engineering 463.)

464 Introduction to Fusion Energy II (3) (Same as Electrical and Computer Engineering 464.)

494 Special Topics in Nuclear Engineering (3) Problems related to recent developments and practice. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used
511-12 Transport Processes in Nuclear Engineering (3,3) Rheology of non-Newtonian fluids; integral and system conservation equations for single and multiphase systems; development of differential conservation equations for mass, energy, and momentum; exact and approximate solutions of equations of motion; layer analysis; numerical analysis of fluid flow and heat transfer.

521 Nuclear Systems Dynamics and Control (3) Introduction to state variables methods for system dynamics and control analysis and application of these methods to nuclear plant dynamics, simulation and control problems.


541 Reactor Fuel Management (3) Topics relative to in-core fuel management. Applicable topics in reactor physics, fuel depletion, isotopic inventories, reactivity control and numerical methods. Prereq: 491.


543 Selected Topics In Nuclear Criticality Safety (3) Criticality safety analysis methods and experimental methods for enrichment, fabrication, storage, reprocessing, and transport applications; regulatory requirements; review of licensing of commercial and defense fuel material facilities in East Tennessee. Prereq: 421.

550 Nuclear Instrumentation (3) Physics and electronics associated with reactor detection, methods of data analysis, and applicability of particular instrument measurements and fundamentals of nuclear instrumentation operation.

551 Radiation Protection (3) Interactions of photons, neutrons, beta particles, and heavy charged particles with matter and mechanisms of energy loss; methods of radiation detection, internal and external radiation dosimetry; chemical and biological effects of radiation; regulations and standards. Prereq: Introduction to Nuclear Engineering or equivalent.

552 Radiation Monitoring and Dose Assessment (3) Methods for work-area and environmental monitoring; dose assessment; pathways analysis; risk projections and regulations. Prereq: 551.

561 Plasma Diagnostics I (3) (Same as Electrical and Computer Engineering 561.)

562 Plasma Diagnostics II (3) (Same as Electrical and Computer Engineering 562.)

563 Plasma Engineering (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology into design of future plasma experiments. Computer modeling of transport, energy, and energy balance equations. Simulation of various fusion reactor plasmas. Prereq: 464 or consent of instructor. (Same as Electrical and Computer Engineering 563.)

564 Fusion Technology (3) Engineering problems associated with fusion reactor design; vacuum and magnetic systems; materials and irradiation; plasma heating, fuelling and impurity control; review of major design studies. Prereq: 563. (Same as Electrical and Computer Engineering 564.)


575 Applied Artificial Intelligence (3) Symbolic methods for artificial intelligence systems with focus on application to engineering problems. Prereq: Consent of instructor. (Same as Engineering Science and Mechanics 575.)

576 Expert Systems in Engineering (3) Application of expert systems in engineering: logic and rationale, development of expert systems, programming, advanced topics. Prereq: 575 or consent of instructor. (Same as Engineering Science and Mechanics 576.)

577 Neural Networks in Engineering (3) Neural network technology for use in intelligent systems; rationale for neural computing, structure of neural computing systems, programming. Prereq: Consent of instructor. (Same as Engineering Science and Mechanics 577.)

581 Reactor Shielding (3) Application of analytic/deterministic solutions of Boltzmann transport equation to shield design problems. Spherical harmonics, moment methods, discrete ordinates, adjoint calculations, coupled analysis, and fast reactor shield design. Prereq: 406 or equivalent.

582 Monte Carlo (3) Analysis of radiation transport problems in radiation shielding by Monte Carlo method. Random sampling, evaluation of integrals, analog particle transport, techniques of variance reduction, forward and adjoint modes of analysis, importance function biasing, splitting/weight window survival biasing and contribution theory. Prereq: 561.

585 Process System Reliability and Safety (3) Qualitative and quantitative techniques for assessing and improving process systems reliability and safety. Fault tree analysis and associated dependent failure analysis. (Same as Chemical Engineering 585.)

586 Measurement Science I (3) Principles of measurement, introduction to measuring devices. Prereq: Consent of instructor. (Same as Chemical Engineering 586, Civil Engineering 588, Electrical and Computer Engineering 588, Engineering Science and Mechanics 586, Mechanical Engineering 586 and Aerospace Engineering 586.)

589 Measurement Science II (3) Modern industrial measurement systems, advanced topics in measurement. Prereq: 586. (Same as Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, Mechanical Engineering 589, and Aerospace Engineering 589.)

597 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with department consent.

598 Nuclear Engineering Practice (3-9) Experience in solving and reporting on engineering problems. Prereq: Approval of department. May be repeated. Enrollment limited to alternate plan students. S/NC only.

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

611-12 Selected Topics in Reactor Theory (3,3) Transport theory, control rod theory, stochastic methods. Selected topics from literature. Prereq: 572.

621 Selected Topics in Radiation Protection (3) Prereq: 551. May be repeated with consent of department.

651 Plasma Engineering II (3) Detailed modeling of plasma breakdown, start up, burn dynamics. Prereq: 564.

652 Special Topics in Fusion Engineering (3) Selected advanced topics in plasma engineering and fusion reactor engineering and technology. Prereq: 561.

653 Theory of Information Processing (3) Modern system theoretical methods for evaluating system performance from dynamic measurements. Prereq: 522 or equivalent.

671 Advanced Topics in Applied Artificial Intelligence (3) Recent advances in engineering applications of artificial intelligence. Prereq: 575. (Same as Engineering Science and Mechanics 671.)

697 Special Topics in Nuclear Engineering (3) Investigation of new developments. Prereq: Consent of instructor.

DEGREE

Nursing

MAJOR

Nursing

Sylvia E. Hart, Dean

Mildred M. Fenske, Associate Dean

Director of M.S.N. Program

Maureen E. Groer, Director of Ph.D. Program

Professors:

Goodfellows, Dale H., Ph.D. Peabody

Groer, Maureen E., Ph.D. Illinois

Hart, Sylvia E., Ph.D. New York

Mozingo, Johnie N., Ph.D. Walden

Reid, Barbara M., Ph.D. Texas

Associate Professors:

Allgood, Martha R., Ph.D. New York

Davis, Mitzi M., Ph.D. Tennessee

Dropkin, Patricia G., Ph.D. Tennessee

Fenske, Mildred M., Ph.D. Vanderbilt

Jolly, Mary Lue, Ed.D. Kentucky

Jowers, Laurie, Ph.D. Texas

Overton, Helen, Ph.D. Maryland

Sharpe, Theresa G., Ed.D. Tennessee

Shoffner, Davita, Ph.D. Tennessee

Smith, Patricia, Ed.D. Tennessee

Thomas, Sandra P., Ph.D. Tennessee

Tuck, Inez, Ph.D. North Carolina (Greensboro)

Assistant Professor:

Browen, Sheila, Ph.D. Tennessee

THE MASTER'S PROGRAM

The College of Nursing offers the Master of Science in Nursing degree with concentrations in adult health nursing, parent-child nursing, mental health nursing, family nurse practitioner, nurse anesthesia and nursing administration.

Admission Requirements

1. Meet requirements for admission to The Graduate School. 2. Hold a Bachelor's degree in Nursing or complete the equivalent of an upper division undergraduate major in nursing in addition to meeting all M.S.N. degree requirements. 3. Have an undergraduate GPA of 3.0 or higher or a GPA of 3.0 for courses in the undergraduate major. 4. Complete the General portion of the Graduate Record Examination. NOTE: A strong performance on this examination may compensate for a GPA lower than 3.0. 5. Complete Graduate Program Data Form. 6. Submit three Graduate School Rating Forms from individuals familiar with the applicant's current work performance or academic aptitude.

Special Requirements

1. Each student must hold personal professional liability insurance.
2. Registered nurses must be licensed to practice nursing in Tennessee.
3. Each student must present proof of a physical examination and rubella immunization or sufficient titers completed within six months of registering for clinical courses.
4. Each student must present evidence of current CPR certification.
5. Non-registered nurse students must have completed 9 semester hours of chemistry or biology, a nutrition, microbiology and anatomy and physiology course, and 12 semester hours of behavioral science courses.

Thesis and Non-Thesis Options
The thesis option is available for interested students and is especially encouraged for those who are considering pursuit of doctoral degrees sometime in the future. Students who choose the non-thesis option must complete a research-oriented project while registered for 580 Nursing Project.

Program Requirements
All students must complete a minimum of 36 semester hours distributed as follows:

Core (12 credits)
503-04 Holistic Nursing 6
510 Theoretical Foundations of Nursing 3
520 Nursing Resource Management 3

Research (9-12 credits)
501-02 Nursing Research: Methods, Design, and Analysis 3
500 Thesis 6 or
580 Nursing Project 3

Concentration (12 credits)—choose one
530-31 Adult Health Nursing I,II 12
540-41 Family Nurse Practitioner I,II 12
550-51 Parent-Child Nursing I,II 12
560-61 Mental Health Nursing I,II 12
590-91 Nursing Administration 12

Elective (3 credits)—waived for those who choose thesis option 3

Students who are not nurses must complete the following undergraduate nursing courses in addition to meeting the requirements listed above:

301 Pharmacology 3
302 Introduction to Professional Nursing 9
304 Nursing Assessment and Health Promotion 4
311 Acute Care Nursing 10
313 Nursing Research 3
414 Community Mental Health Nursing 6
415 Family/Community Health Nursing 6

Registered nurses whose undergraduate degrees are not in nursing must complete 304, 305, 313, 315 Clinical Nursing Practice, and 403. They must also complete or successfully challenge the following:

301 Pharmacology 3
312 Acute Care Nursing Theory 6
402 Family Health Nursing Theory 3
412 Psychosocial Long Term Nursing Theory 3

Students whose science backgrounds are deficient may also need to take 214 Integrated Biomedical and Health Sciences and/or 450 Physiological Principles.

Final Examination Requirements
All students must successfully complete a final examination as required by The Graduate School. For thesis students, the examination will consist of an oral defense of the thesis as well as other written or oral questions designed to measure student mastery of the entire program of study. For non-thesis students, the written examination will cover the entire program of study and may, at the discretion of the student's committee, be followed by an oral examination.

Special Policies
1. 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 course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.
3. If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.

REQUIREMENTS FOR SECOND MASTER'S DEGREE
1. Those who already hold a Master's or doctoral degree may apply up to 6 semester hours from that degree to meeting MSN program requirements. To apply these hours to the MSN degree, the following criteria must be met:
   a. The courses used must be relevant to the MSN.
   b. The credits must have been earned within the time limits established for the MSN.
   c. The use of these courses must be approved by the student's committee, by the Dean of the College, and by the Dean of The Graduate School.
2. Regardless of the specific courses transferred to reduce degree requirements, the following minimum of required nursing courses must be completed:
   - Core 12
   - Concentration 9
   - Research 6

THE DOCTORAL PROGRAM
The College of Nursing offers a doctoral program leading to the Doctor of Philosophy degree with a major in Nursing. This is a cooperative program offered jointly with the University of Tennessee, Memphis College of Nursing. Students may complete all or part of the program at either site. The dissertation must be completed in its entirety at one site.

The doctoral program prepares nursing scholars capable of integrating research, theory, and practice into their roles as researchers, educators, and/or administrators. Specifically, the graduate of this program should be able to:
1. Analyze, test, refine, extend, and expand the theoretical basis of nursing practice.
2. Conduct nursing research that generates and advances nursing as a discipline.
3. Provide leadership as nurse researchers, educators, and/or administrators in current and emerging health care settings.
4. Collaborate with members of other disciplines in health-related research of mutual concern.
5. Analyze, develop, and recommend health care policy at various levels.

Admission Requirements
1. Meet requirements for admission to The Graduate School.
2. Hold a Master's degree in nursing from a program accredited by the National League for Nursing.
3. Have a minimum cumulative graduate grade-point average of 3.3 on a 4.0 scale.
4. Have a cumulative score of at least 1000 on the verbal and quantitative sections of the Graduate Record Examination.
5. Have successfully completed a basic statistics course.
6. Complete Graduate Program Data Form, College of Nursing.
7. Submit Graduate School Rating Forms from three college level instructors and/or nurses and administrators who have supervised applicant's professional work.
8. Have a personal interview with the College of Nursing Graduate Student Admissions Committee.
9. Submit entire application (Graduate Application for Admission, 3 Graduate School Rating forms, Graduate Program Data form, academic transcripts, and GRE scores) and schedule personal interview by March 1st of the year preceding Fall admission.

Program Requirements
The following courses are required for all students:
601-2 Theory Construction and Analysis I, II 6
602-4 Advanced Nursing Research I, II 6
605-6 Nursing Research Seminar 4
611 Advanced Nursing Seminar 2
614 Nursing Preceptorship 3
620-2 Statistics 6
630 Computer Science 3
640-4 Electives 12
660-9 Dissertation 24
TOTAL 66

The electives should constitute a cognate area. All 12 hours should be selected from a specific area of concentration. Appropriate cognate areas are anthropology, child and family studies, clinical psychology, educational administration, educational psychology, management, medical ethics, public health, and social work.

Doctoral Committee
The student and major professor identify a committee composed of at least five faculty members who hold the rank of assistant professor or above, four of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. Two of the faculty members must be from an academic unit other than nursing. The committee should be formed during the student's first year of doctoral study.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Nursing is available to residents of the state of Alabama. Additional information may be obtained from the Residency
500 Thesis (1-15) P/NP only. E


502 Registration for Use of Facilities (3-15) Required for all students. Credit and no credit during first 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.

503 Holistic Nursing: Wellness (3) Examination of philosophy of holistic nursing and new paradigms for nursing assessment, diagnosis, and intervention. Exploration and application of principles of health promotion, education and innovative strategies for achievement of wellness. Roles of health habits, genetics, psychological factors, and culture in lifestyle diseases. F

504 Holistic Nursing: Illness (3) Exploration, analysis, and application of principles of holistic nursing of clients with acute and chronic pathophysiological disease. Mind-body influences and interactions. Prereq. Nursing Assessment and Wellness Promotion and Physiological Principles or equivalents. Prereq. or coreq. 503. F

506 Advanced Clinical Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq. 301 or equivalent or consent of instructor. F

509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nutrition 509, Physical Education 509 and Social Work 509.)

510 Theoretical Foundations of Nursing (3) Historical evolution of nursing science; examination and critical analysis of nursing's metaparadigm and selected conceptual models, philosophies, and theories; contemporary ethical theories and application to nursing practice dilemmas. F, Sp, Su

520 Nursing Resource Management (3) Selected organizational, conflict management, decision-making, leadership, professional, technological, and other theories, principles, and concepts applicable to advanced clinical nursing practice. Prereq. or coreq. 503. F, Sp

530 Adult Health Nursing I (6) Exploration and application of advanced nursing, physiological, developmental, and psychological theories to nursing care and management of clients and their families who are experiencing acute and chronic illness and related crises; role of clinical nurse specialist in helping clients and families achieve optimal wellness. Prereq. 504, Prereq. or coreq. 501, 520. 2 hrs and 4 labs. Sp

531 Adult Health Nursing II (6) Further emphasis on role of clinical nurse specialist in providing and managing nursing care for acutely and chronically ill adults across life span; exploration, analysis, and application of selected advanced management, supervisory, organizational, and leadership theories; application of health-related concepts and research to implementation of clinical nurse specialist role. Prereq. 530. 2 hrs and 4 labs. F

533 Directed Study in Clinical Nursing Education (3) Philosophy, history and contemporary issues in technical nursing and nursing education; teaching strategies and application of principles of holism to nursing of clients in a variety of settings. Prereq. Graduate student or consent of instructor. F

540 Family Nurse Practitioner I (6) Exploration and application of holistic nursing theories to nursing management of common health problems of individuals and their families; opportunities for clinical practice in role of nurse practitioner in a variety of settings. Prereq. 504. Prereq. or coreq. 501, 520. 2 hrs and 4 labs. Sp

541 Family Nurse Practitioner II (6) Continuation of 540. Supervision of student in chronic nursing practice issues and management of chronic health problems in all developmental life stages; role refinement and exploration of major issues in delivering of holistic primary nursing care: clinical experiences in a variety of settings. Prereq. 540. 2 hrs and 4 labs. F

550 Parent Child Nursing I (6) Exploration and application of selected advanced nursing, physiological, psychological, developmental, environmental, cultural, and other theories, principles and concepts to child-bearing families and/or child-rearing families in acute care or community settings; family wellness promotion and interventions designed to support wellness of parents, neonates, children, and adolescents. Prereq. 504. Prereq. or coreq. 551, 520. 2 hrs and 4 labs. Sp

551 Parent Child Nursing II (6) Continuation of 550. Seminar and clinical practicum designed to further develop of specialized knowledge and skills utilized for advanced parent-child nursing practice. Prereq. or coreq. 551. 1 hr and 4 labs. Sp

560 Mental Health Nursing I (6) Exploration and application of advanced theories of therapeutic nursing intervention to clients experiencing mental health problems. Options include: choice of mental health groups, acute care in community facilities. Prereq. 504, Prereq. or coreq. 510, 520. 2 hrs and 4 labs. Sp

561 Mental Health Nursing II (6) Continuation of 560. Groups and families with mental health problems. Seminar and clinical practicum designed to focus on advanced practice and development of specialized knowledge and skills. Prereq. 560. 2 hrs and 4 labs.

563 Teaching Strategies and Practicum (5) Exploration, analysis, and application of selected educational, curricular, teaching-learning, measurement, and evaluation principles and theories to instruction of undergraduate nursing students; teaching practicum in collegiate nursing programs. Prereq. or coreq. 531, 541, 551, or 561. 3 hrs and 2 labs. Sp

577 Special Topics (1-3) Topic is determined by faculty and student interest. Prereq. Consent of instructor. May be repeated. Maximum 6 hrs. F, Sp

580 Nursing Project (3) Research-oriented, student-initiate endeavors that culminates in scholarly paper suitable for publication and/or presentation; project may take form of development of innovative nursing intervention program, comprehensive literature review that reflects synthesis or comprehensive analysis, or other formats approved by nursing faculty member. Required for all MSN candidates who select non-thesis option. Prereq: 301, 501, 510. Maximum 6 hrs. F, Sp

583 Directed Clinical Practice (1-9) Additional opportunities for advanced nursing practice. Objectives to be developed collaboratively by student and faculty. Prereq: Enrollment in or completion of graduate level courses in clinical nursing. Maximum 9 hrs. S/N/C or letter grade E

585 Seminar in Gerontology (1) (Same as Human Ecology 505, Educational and Counseling Psychology 505, Physical Education 505, Psychology 505, Public Health 505, Social Work 505, and Sociology 505.)

590 Nursing Administration I (6) Exploration, analysis and application of selected organizational, management, and leadership theories and principles to delivery of nursing services. Structure, functions, organization, behavior and the role of management in health care organizations. Prereq. 504, Prereq. or coreq. 501, 520. 2 hrs and 4 labs. Sp

591 Nursing Administration II (6) Continuation of 590. Utilization of human and financial resources, conflict resolution, and organizational development with application to mid-level and top-level nursing administration positions. Prereq. 550. 2 hrs and 4 labs. F

593 Independent Study (1-3) Prereq. Consent of instructor. Preregistration required. Prereq or coreq. 501. 2 hrs and 4 labs.

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

601-02 Theory Construction and Analysis I, II (3,3) Theory development; analysis of existing health disciplines, and development of new paradigms for health care. Objectives to be developed collaboratively by student and faculty. Pre-req. 301, 501, or consent of instructor. F, Sp

603 Advanced Nursing Research I (3) Advanced concepts in research methodology and data analysis and interpretation. Quantitative nursing research. Prereq. 601. 6 hrs of graduate-level statistics. F

604 Advanced Nursing Research II (3) Continuation of 603. Qualitative nursing research. Prereq. 603. Sp

605-06 Nursing Research Seminar (2,2) Selected research topics. Required of all doctoral students. Prereq. 604. F, Sp

611 Advanced Nursing Seminar (2) Current health and nursing issues; analysis and critique of current research on nursing and health care delivery system. Prereq. 620. Sp

612 Health and Nursing Policy/Planning (3) Policies affecting nursing education and practice; health policies and political processes; interactions between health professionals, consumer groups, and government in health policy development and health planning activities. Prereq. 611. F


614 Nursing Preceptorship (3) Individually-designed practicum, field, or internship experiences in varieties of administrative, educational research, and clinical practice settings. Prereq: 612. Prereq or coreq: 613. Sp

Nutrition

Nutrition (College of Human Ecology)

MAJORS

DEGREES

Nutrition

M.S.

Foodservice and Lodging Administration

M.S.

Human Ecology

Ph.D.

Michael B. Zemel, Head

Professors:

Beauchene, Roy E., Ph.D. . Kansas State
Carruth, Betty Rush, Ph.D. . Missouri
Quinton, H. W., Ed.D . Duke
Sachan, Dileep S., Ph.D . Illinois
Zemel, Michael, Ph.D . Wisconsin

Associate Professors:

Andrews, Frances E., Ph.D. . Ohio State
Brooks, M. D. (Memphis), M.S. . Alabama
Hautaung, B., Ed.D. . Colorado
Skinner, Jean D., Ph.D. . Oregon State

Assistant Professors:

Bailey, James W., Ph.D. . Iowa State
Chanchiar, Janet (Memphis), M.S. . Maryland
Costello, Carol, Ph.D. . Tennessee
Powell, J. A. (Memphis), M.P.H . North Carolina
Sneed, P., Ph.D. . Ohio State
Zemel, Paula, Ph.D. . Wayne State

Instructors:

Jones, K., MBA . East Texas State
McGrath, M., M.S. . Purdue

Master of Science programs are available in Nutrition and in Foodservice and Lodging Administration. Within the Nutrition program, a
A graduate degree combined with an approved pre-professional practice experience (AP4) beyond the baccalaureate degree qualifies the graduate to apply for the Registration Examination to become a Registered Dietitian (RD). Students may request more information from the department about the AP4 program.

ADMISSION REQUIREMENTS

A final file for review includes the Graduate School application file, completed departmental application form, Graduate Record Examination (GRE) scores for the general section, and three Graduate School Rating Forms completed by individuals who can attest to the applicant's potential for graduate education. Forms may be obtained from the Graduate Office, 118A Jessie Harris Building, University of Tennessee, Knoxville, 37996-1900.

Admission into any of the graduate programs in the department is dependent on completion of undergraduate coursework necessary for graduate study, and graduate-level statistics. The doctoral program emphasizes human nutrition, nutritional epidemiology, and research methodology. 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); 2. NTR 511, 512, 541, and 2 hours from either 542-544 and 3 hours of graduate level statistics.
3. Four hours of NTR 540, attendance required every semester;
4. Professional seminar, HE 610;
5. Six hours of statistics;
6. Six hours in a cognate area; 7. Nine hours at the 600 level;
8. Students without college teaching experience are required to take the fall semester teaching seminar (FTS) and NTR 540, comprising a faculty-supervised problem in college teaching.

Consumer Environments

Students enrolled in the Ph.D. program with a concentration in consumer environments are required to complete a foundation of coursework relevant to understanding the consumer in the designed environment and management of facilities. Concurrent field experiences. Prereq: Advanced Nutrition or consent of instructor. F, A

Nutrition

THE PH.D. CONCENTRATIONS

Nutrition Science

The nutrition science concentration enables students to apply the principles related to growth and development to the consumer in the designed environment and management of facilities. Prereq: Advanced Nutrition or consent of instructor. F, A

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville in an in-state tuition basis. The M.S. program in Foodservice and Lodging Administration is available to residents of the states of Arkansas, Kentucky, South Carolina, or West Virginia. The M.S. program in Nutrition is available to residents of Arkansas, South Carolina, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.
counting, production, nutrient analysis, room management, and sales planning and analysis. Prereq: Quantity Food Procurement, Production and Service, Microcomputer Applications or consent of instructor. F,A

531 Advanced Financial Management (3) Financial planning, operations and 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.

532 Advanced Human Resource Management (3) Identifying labor needs, development and maintenance of work force. Prereq: Food and Lodging Personnel Development or consent of instructor.

533 Advanced Food Production and Delivery System Management (3) Analysis of food production and delivery systems; application of quantitative methods and models to optimize decisions. Prereq: Quantity Food Procurement, Production and Service or consent of instructor.

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.

535 Directed Study in Foodservice and Lodging Administration (1-3) Problems selected for study by student with guidance of faculty member. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

537 Seminar in Foodservice and Lodging Administration (1) May be repeated. S/NC only. Sp

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.

544 Experimental Study of Quantity Food Production (3) Design and preparation of food products applicable to foodservice industry. Market research, sensory evaluation, production techniques, and microbiological evaluation of food. Prereq: Quantity Food Procurement, Production and Service, Microcomputer Applications or consent of instructor. F

546 Foodservice and Lodging Administration Research Methods (2) Application of research methods to foodservice and lodging. Prereq or coreq: Nutrition 541. Sp

Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. S/NC only. E

603 Current Trends in Food and Sociocultural Change (2) Critical evaluation of research. Prereq: 508 or consent of instructor. F,A

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

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

530 Computer-Assisted Foodservice and Lodging Management (3) Application of computer technology to foodservice and lodging industry; inventory, cost ac-
### Pathobiology

**Course Details**

**Pathobiology** (College of Veterinary Medicine)

<table>
<thead>
<tr>
<th>Major</th>
<th>Degree</th>
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<tr>
<td>Veterinary Medicine</td>
<td>D.V.M.</td>
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#### Pathobiology Faculty

**Professors:**
- Edwardes, D. F., D.V.M.
- McGavin, M. D., Ph.D.
- Patton, S., D.V.M.
- Schuller, H. M., D.V.M., Ph.D.
- Shull, R. M., D.V.M.
- Slauson, D. O., D.V.M.
- McCracken, M. D., D.V.M., Ph.D.
- Breid, M. A., D.V.M., Ph.D.
- Fusion, E. W., Adjunct, Ph.D.
- Slauson, D. O., D.V.M., Ph.D.
- Bochsler, P. N., D.V.M., Ph.D.
- Godfrey, V. (Adjunct), D.V.M., Ph.D.
- Munden, D. V.M., Ph.D.
- Wilkins, D., D.V.M., Ph.D.

**Assistant Professors:**
- Breider, M. A., D.V.M., Ph.D.
- Slauson, D. O., D.V.M., Ph.D.

**Instructor:**
- Petersen, M. G., D.V.M., Ph.D.

**Post-Doctoral Research Associates:**
- Katz, D. S., Ph.D.
- Slauson, D. O., D.V.M., Ph.D.
- Liu, Xiaochan, M.D.

**Residents:**
- Bouley, D., D.V.M.
- Deal, D. F. D.V.M.
- Donnell, R., D.V.M.
- Duncan, R. B., D.V.M.
- Silva-Krott, I., B.V.Sc.

**See Veterinary Medicine for Program Description.**

### GRADUATE COURSES

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

**501 Special Topics in Pathobiology (1-2) May be repeated. Maximum 6 hrs, E**

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

**503 Comparative Pathology (3) Pathogenic mechanisms. Comparative aspects. Study of gross, microscopic and ultrastructural lesions. Prereq: Histology, 2 hrs and 1 lab, Sp, A**

**500 Doctoral Research and Dissertation (3-15) P/NP only, E**

**501 Advanced Topics in Pathobiology (1-3) Neoplasms, hematopathology, clinical pathology, clinical parasitology, clinical immunology, clinical bacteriology and mycology, and clinical virology. May be repeated. Maximum 6 hrs, E, A**

**502 Veterinary Biopsy (1-2) Examination of biopsy specimens and interpretation of observations. Preparation of specimens for sectioning. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs, E, A**

**503 Correlative Post-Mortem Pathology (1-3) Gross and microscopic post-mortem examination of animals. Correlative interpretation of clinical diseases and lesions. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs, E, A**

**504 Veterinary Pathology Seminar (1) Microscopic slides and transparencies of lesions from cases examined by pathologists, residents, and graduate students. Interpretation of observations. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs, E**

**505 Pathobiology Seminar (1) Subjects of current interest in biomedical science. Students present one seminar per term enrolled. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. Class meets once monthly, E**

**606 Ultrastructural Pathology (1) Ultrastructural changes in diseased cells. Interpretation of observations. Prereq: Professional medical degree or consent of instructor, F, A**

**607 Diagnosis and Pathogenesis of Virus Diseases of Domestic Animals (3) Advanced study of virus diseases important to domestic animals: virus biology, pathogenesis, pathology and diagnosis Technical training in virus diseases diagnosis. Prereq: Cellular and Comparative Biochemistry, and Advanced Topics in Biochemistry, Virology and Virology Lab, or Microbiology-Veterinary Medicine 611-612, 2 hrs and 1 lab, Sp, A**

**608 Techniques in Pathology (2) Fixation, processing and staining of tissue specimens; specialized gross dissection techniques; photography of gross specimens and photomicrography. Prereq: Consent of instructor. F, A**

**609 Principles of Pathology (4) Advanced topics in pathology and mechanisms of disease: pathophysiology, cellular degeneration, inflammation, immunopathology, hemorrhage, Principal biochemical and morphologic responses of various cells, tissues, and organs to injury and other metabolic derangements. Participants present seminars on selected topics from current literature and textbooks. Prereq: Consent of instructor, F, A**
Philosophy

(College of Liberal Arts)

MAJOR DEGREES

Philosophy ........................................ M.A., Ph.D.

Associate Professors:

Cebik, L. B., Ph.D. ................................... Nebraska

Brenkert, George G., Ph.D. ........................ Michigan

Aquila, Richard E., Ph.D. ............................ Northwestern

Professor: George G. Brenkert, Head

Assistant Professors:

Aquilina, Richard E., Ph.D. ................................... Northwestern

Brenkert, George G., Ph.D. ............................ Michigan

Cebik, L. B., Ph.D. ...................................... Nebraska

Davis, John W., Ph.D. ................................... Emory

Edwards, Rem B., Ph.D. ................................. Emory

Grabber, Glenn C., Ph.D. ............................... Michigan

Postow, Betsy C., Ph.D. ................................. Yale

Van de Vate, Dwight Jr., Ph.D. ........................ Yale

Associate Professors:

Bennett, James O., Ph.D. ............................... Tulane

Cohen, Sheldon M., Ph.D. ............................... Northwestern

Bohstedt, Kathleen Emmett, Ph.D. ................. Ohio State

Lavin, Michael, Ph.D. .................................. Stanford

Nolt, John E., Ph.D. ..................................... Ohio State

Osborne, Martha Lee, Ph.D. ............................. Tennessee

Hamlin, H. Phillips, Ph.D. .............................. Georgia

The Department of Philosophy offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes thesis and non-thesis options and offers concentrations in medical ethics and in religious studies. The Ph.D. program also has a concentration in medical ethics. Detailed information may be obtained from the Director of Graduate Studies in Philosophy. The Director of Graduate Studies in Philosophy is in the Office of Graduate Studies.

THE MASTER'S PROGRAM

The department offers both a thesis and a non-thesis option. The course requirements for an M.A. with thesis are 30 hours, including 6 hours in Philosophy 500. Of non-thesis hours, at least two-thirds must be in courses at or above the 500 level. No philosophy course numbered under 400 may be taken for graduate credit. There are no particular courses that M.A. students are required to take. The nature of the student's coursework should be determined in consultation with the student's faculty committee.

THE DOCTORAL PROGRAM

Specific requirements for doctoral students in Philosophy include a minimum of three academic years of graduate study involving at least 48 semester hours in coursework (normally 16 semester courses or their equivalent, exclusive of credit for thesis and dissertation) of which no fewer than 30 hours shall be in courses numbered over 500 and no fewer than 6 hours shall be in courses numbered over 600. The specific number and distribution of courses will be determined by the student's faculty committee.

Students must demonstrate a reading knowledge of one foreign language, normally a living language in which there exists a significant body of philosophical literature. (In special circumstances relating to the area of dissertation research, the Graduate Committee may approve a language not satisfying these conditions.) This may be done by passing the doctoral language examination given by the appropriate department, if available, or by passing French 302 or German 332 with a B or better. Bi- or multilingual (normally, foreign) students, whose native language (other than English) is one in which there is a significant body of philosophical literature, are exempted from the foreign language requirement. Students receiving the Ph.D. with concentration in medical ethics are also exempted.

CONCENTRATIONS

Medical Ethics

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Detailed information concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Director of the Medical Ethics Program.

Religious Studies

The department has an M.A. program of graduate study with a concentration in religious studies. Details concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Department of Religious Studies.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

400 Special Topics (3) May be repeated when topic varies. Maximum 6 hrs.

411 Modern Religious Philosophies (3) (Same as Religious Studies 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) (Same as Religious Studies 412.)

420 Topics in History of Philosophy (3) Figures or movements from antiquity through mid-twentieth century. Prereq: 6 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.

425 American Philosophy (3) Colonial to early 20th Century. Prereq: 6 hrs of philosophy or consent of instructor.

430 Topics in Logic (3) Prereq: 6 hrs of logic or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

440 Contemporary Ethical Theory (3) Topics in meta-ethics or ethics. Prereq: 6 hrs of philosophy or consent of instructor.

446 Theoretical Issues in Medical Ethics (3) Prereq: 240 or 345 or consent of instructor. (Same as Religious Studies 446.)

460 Philosophy of Science (3) Methodological and conceptual issues in natural and social sciences; patterns of theory modification and replacement, nature of explanation and causation, status of calculation. Prereq: 356 and 1 yr of natural or social science, or consent of instructor.

465 Philosophy of History (3) Speculative and critical aspects of history of philosophy. Prereq: 6 hrs of philosophy or consent of instructor.

473 Philosophy of Mind (3) Problems of mind and body in relation to consciousness and personal identity. Prereq: 6 hrs of philosophy or consent of instructor.

474 Analytic Metaphysics and Epistemology (3) Topics in metaphysics and epistemology in recent Anglo-American tradition. Prereq: 6 hrs of philosophy or consent of instructor.

476 Philosophy of Language (3) Survey of issues such as meaning, reference, and truth. Prereq: 6 hrs of philosophy or consent of instructor.

479 Studies in Recent Continental Philosophy (3) Selected thinkers or topics: existentialism, phenomenology, hermeneutics, structuralism, post-structuralism, and deconstruction. May be repeated when topic varies. Maximum 6 hrs.

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

502 Registration for Use of Facilities (3-15) Required for non-thesis option. An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.A. and Ph.D. programs in Philosophy are available to residents of the states of Alabama, Kentucky, Maryland, Texas, Virginia, or West Virginia; and the Ph.D. program to residents of Arkansas, Louisiana, or Mississippi. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

520 Topics in the History of Ancient and Medieval Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

522 Topics in the History of Modern Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

524 Topics in the History of Twentieth-Century European Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

527 Topics in the History of American Philosophy (3) Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

530 Topics in Logic and Philosophy of Mathematics (3) May be repeated. Maximum 9 hrs.

540 Topics in Value Theory (3) May be repeated. Maximum 9 hrs.

542 Ethics (3) Dominant movements in history of ethics. May be repeated. Maximum 9 hrs.

544 Applied Ethical Theory (3) Single author, tradition, or topic in ethical theory, application to issues in health, business, technology, ecology, and other practical fields. Maximum 9 hrs. (Same as Religious Studies 544.)

545 Orientation to Medical Ethics (3) Survey of ethical theories in application to issues in medical ethics. Prereq: Consent of Medical Ethics Committee.

547 Clinical Medical Ethics (3) Medical terminology, history of medical ethics, case study discussion, clinical observation. Open only to students concentrating in medical ethics. May be repeated. Maximum 4 hrs. S/NC or letter grade.

548 Clinical Residency in Medical Ethics (3-12) Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics Committee. May be repeated. Maximum 20 hrs. S/NC only.

553 Philosophical Topics in Literature and the Arts (3) Aesthetics, criticism, art and society. May be repeated. Maximum 9 hrs.

556 Philosophy of Natural Sciences (3) Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.


570 Philosophy of Religion (3) Examination of central problems. (Same as Religious Studies 570.)
Professor: William M. Bugg, Head

Professors:
- Bingham, C. R., Ph.D.  Tennessee
- Bless, W. E., Ph.D.  Michigan State
- Bottcher, C. Ph.D.  Belfast
- Breazeale, M. A. (On Leave), Ph.D.  Michigan State
- Childers, W. R., Ph.D.  Vanderbilt
- Christophorou, L. G., Ph.D.  Manchester
- Close, F. E. (Distinguished Scientist) (On Leave), Ph.D.  Purdue
- Condo, G. T., Ph.D.  Illinois
- Craiter, H. W. (UTSI), Ph.D.  Yale
- Davids, W. E. (Emeritus), Ph.D.  Ohio State
- Duckett, K. E., Ph.D.  Tennessee
- Foote, K. Ph.D.  Michigan
- Gallai, N. M. (Emeritus), Ph.D.  Ohio State
- Georgiou, S. Ph.D.  Manchester
- Gubshhina, M. W. Ph.D.  Tennessee
- Harris, E. G. (Distinguished Prof.), Ph.D.  Tennessee
- Hart, E. L. Ph.D.  Cornell
- Jacobson, H. C. Ph.D.  Yale

Associate Professors:
- Breining, M. Ph.D.  Oregon
- Elston, S. B., Ph.D.  MIT
- Ferrell, T., Ph.D.  Clemson
- Handler, T. H., Ph.D.  Rutgers
- Lide, R. W., Ph.D.  Michigan
- Muehleman, J. W. (UTSI), Ph.D.  Tennessee
- Shieh, S. Y., Ph.D.  Maryland
- Sorensen, P. S., Ph.D.  Copenhagen

Assistant Professors:
- Canright, G. Ph.D.  Tennessee
- Daunt, S. J., Ph.D.  Queens
- Hartz, R. Ph.D.  Ohio State
- Menzel, R. (UTSI), Ph.D.  Tennessee
- Sanders, A. J., Ph.D.  Tufts

Research Associate Professors:
- Du, Yuan-Cai, Ph.D.  Beijing
- McCorridd, D. L., Ph.D.  Tennessee

Research Assistant Professors:
- Davis, L. (UTSI), Ph.D.  Australia
- Fiaidis, H., Ph.D.  Tennessee
- Warmack, R. J., Ph.D.  Tennessee

Lecturers:
- Fairman, R. C., B.A.  Earlham
- Riedinger, T. M. S.  Vanderbilt

Graduate programs leading to the Master of Science and the Doctor of Philosophy are offered in a number of concentration areas: atomic and low temperature physics, biophysical chemistry, elementary particle physics, health physics, heavy ion atomic physics, molecular spectroscopy, nuclear physics, plasma physics, condensed matter physics, theoretical physics, and astrophysics.

Departmental graduate programs leading to the M.S. and Ph.D. are also available at The University of Tennessee Space Institute, Tullahoma, where opportunities for study and research are available in quantum optics and laser physics, atomic and molecular spectroscopy, fluid physics, and theoretical physics. For additional information, contact the department head.

ADMISSION REQUIREMENTS
A student who enrolls in The Graduate School with the intention of attaining an advanced degree in Physics will have completed an undergraduate major in Physics or its equivalent. Physics 311-12, 521-32, 541-42, and 641-62-63 or 411-12 constitute the minimum courses prerequisite to graduate study.

A student who intends to present Physics as a graduate minor will have completed an undergraduate minor in Physics or its equivalent. Physics 311 and 431-32 constitute the minimum coursework prerequisite to a minor in Physics.

All first-year graduate students are required, for advising purposes only, to take a qualifying examination in undergraduate physics during the fall semester registration period.

THE MASTER'S PROGRAM

Thesis Option
This program is designed primarily for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 24 semester hours of physics courses, of which at least 12 semester hours are taken from Physics 511-12, 521-22, 531-32, 541-42, or 571-72. Each candidate must present an acceptable thesis, 6 hours of 500, and pass an oral examination on course material and thesis.

Non-Thesis Option
This program is designed primarily for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students seeking the non-thesis option must apply to the department's graduate committee for permission to enroll under this program. The requirements are the satisfactory completion of 30 hours of coursework composed of 18 semester hours from Physics 511-12, 521-22, 531-32, 541-42, and 571-72; 6 semester hours in a minor field; and 6 semester hours from other courses numbered above 400 (preferably of advanced laboratory nature.) At least 20 hours must be taken at the 500 level or above. In addition, the candidate must pass a written examination administered by the/this committee.

THE DOCTORAL PROGRAM
All students are expected to take Physics 521-22, 531, 541-42, 551, 561, 571-72, and 611. Physics 601-02 are normally required of students specializing in atomic physics; Physics 621-22 of students in nuclear physics; Physics 626-27 of students in elementary particle physics; Physics 663-64 of students in plasma physics; Physics 661-62 of students in health physics; Physics 671-72 of students in solid state physics; and Physics 681-82 of students specializing in molecular spectroscopy. Students specializing in chemical physics may
Astronomy

GRADUATE COURSES

411 Astrophysics (3) Development of analytical physical models of galactic structure of universe, stellar and interstellar matter, and planetary systems. Topics related to mathematical and computational aspects of quantum mechanics, black holes and current developments in field. Acceptable for major credit in physics. Prereq: Physics 232 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 9 hrs.

Physical

GRADUATE COURSES

402 Forefront of Physics (2) Survey of modern developments in physics: various forms of quantum mechanics, quantum electrodynamics and recent theories of particles, fields and their interactions. Discussion of unsolved questions in physics, experiments of current interest, readings in recent literature, and applications in other fields, with final oral report and term paper. Recommended for beginning graduate students. Prereq: 401 or consent of instructor.


421 Modern Optics (4) Transmission of light in uniform, isotropic media; reflection and transmission at inter- faces; mathematics of wave motion and interference effects. Rudiments of Fourier optics and holography. Prereq: 431 or 232 and consent of instructor. 3 hrs and 3 labs.

425 Principles of Nondestructive Testing (3) (Same as Engineering Science and Mechanics 425.)


461-62-63 Modern Physics Laboratory (3,3,3) Experimental techniques; spectroscopy, electron microscopy, mass spectrometry, computer-aided resonance detectors and statistical analysis, applied to experiments in nuclear, atomic, molecular, and solid-state systems. Classical experiments in quantum physics for advanced undergraduates, and more modern experiments useful for entering graduate students. Prereq: 232 and basic knowledge of circuits.


490 Senior Seminar (1-3) Topic of current interest. May be repeated with consent of department. Maximum 6 hrs.

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

501 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. Maximum 6 hrs. S/NC only. E

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

505 Physics of Fluids (3) Fluid physics, overview of fluid mechanics and associated computational techniques; general description of laminar and turbulent flows; subsonic, supersonic and hypersonic flows; continuum, transitional and free-molecular flows; pipe flow, nozzle flow and sonic orifice expansion flows; reacting and nonreacting flows; shock-tube physics; and an introduction to the method of characteristics and Monte Carlo computational techniques.

506 Experimental Methods (3) Principles, real operational behavior, and hazards of laser types, radiation detectors, photomultiplier tubes, image intensifiers, image converters, image dissectors, streak cameras, and fast framing cameras; high-vacuum systems including cryogenic-based devices, data acquisition techniques including synchronous detection, digital electronic methods and computer-data acquisition and registration methods.

507 Contemporary Optics (3) Topics in geometrical, physical, Fourier, and nonlinear optics and introductory laser physics. Techniques of calculation and design of practical and sophisticated optical systems.

508 Laser Physics (3) Mode analysis, stable resonators; rate equations and population inversion; laser stability; quantum theory of laser; photon coherence and quantum properties; frequency and intensity stabilizations; specific laser types: semiconductor and solid-state, excimer, copper vapor and dye lasers.

511-12 Theoretical Physics (3,3) Classical theoretical physics, with limited use of mathematics. Prereq: 312, 432, advanced calculus, differential equations, and vector analysis.

521-22 Quantum Mechanics (3,3) Fundamental principles of quantum mechanics, free particle, harmonic oscillator, hydrogen atom, quantum field theory, quantum spin, particles in electric and magnetic fields, perturbation theory, variational methods, scattering theory. Application of quantum mechanics to atomic and nuclear systems, energy levels, wave propagation, and atomic and molecular structure. Prereq: 431-32. Prereq or coreq for 541: 571-72. Prereq or coreq for 542: 541-72.


551-72 Mathematical Methods in Physics (3,3) Linear vector spaces, matrices, tensors, curvature, coordinate systems, functions of a complex variable, partial differential equations and boundary value problems, Green's functions, integral transforms and use of computer programs, spherical harmonics, Bessel functions, calculus of variations. Prereq: Advanced calculus and differential equations. May be taken in sequence. (Same as Mathematics 517-18.)

573 Numerical Methods in Physics (3) Numerical methods for solution of physical problems, use of digital computers, data analysis of errors. Prereq: 571-72 or consent of instructor.

574-75 Group Theory for Physicists (3,3) Introduction to abstract group theory, discrete and continuous groups, representation theory. Noether's theorem, symmetries and degeneracies, application of group theoretical methods to atomic physics, solid-state physics, and particle physics. Prereq: 571-72.

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

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

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

594 Special Problems (3) Especially assigned theoretical or experimental work on problems not covered in other courses. May be repeated. Maximum 9 hrs. E


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


605 Laser Spectroscopy (3) Application of lasers to spectroscopy of atomic and molecular systems; review of classical multiple-pole radiation, atomic L-S and J-J coupling and Zeeman effects, spontaneous emission of atomic systems and oscillator strength, selection rules for transitions, theory of atomic and molecular aspects of atomic and molecular systems, molten and solid-state, laser and high-density gases, dielectrics, nonlinear effects, optical resonance and hyperfine spectroscopy. Prereq: 502, 541, 508.

606-07 Nonlinear Optics (3,3) Nonlinear optical susceptibility, wave propagation in nonlinear media, sum and difference frequency and difference frequency generation, harmonic generation, parametric amplification and oscillation, stimulated Raman processes, two- and multi-photon processes, four-wave mixing and phase conjugation, transient coherent optical effects and free induction decay, optical feedback and nonlinear effects in plasmas. Prereq: 522.
609-09 Quantum Electronics and Electro-Optics (3,3) Electromagnetic propagation in anisotropic and periodic media, interband transitions, band structure, quantum electrodynamics, and femtosecond optical switching and electronics, and optical computers and processors. Prereq: 506.

610 Quantum Optics (3) Quantum theory of emission and absorption of radiation, frequency-dependent susceptibility, correlation functions, field quantization and coherent photon states; interaction of radiation with atoms; photon optics, counting and higher-order coherence. Prereq: 522.

611 Advanced Quantum Mechanics & Field Theory (3) Second quantization, quantization of electromagnetic field, emission, absorption, and scattering of light, bremsstrahlung, pair creation and annihilation, quantum field theory in condensed matter physics, and quantum optics. Topics vary according to instructor. Prereq: 522 and 542, or equivalent. Prereq or cons. of instructor.

612 Advanced Topics in Quantum Field Theory (3) Renormalization, Lamb shift, anomalous magnetic moments, gauge theories, electroweak theory, quantum chromodynamics, grand unified theories, and advanced topics in laser physics and quantum optics. Topics vary according to interest of students, instructor and present state of physics. Prereq: 561 or 611 or consent of instructor.

617-18 Lie Algebras in Mechanics and Physics (3,3) (Same as Mathematics 617-18.)

621-22 Nuclear Structure (3,3) General properties of nucleus: two-body scattering problems; saturation and symmetry properties of nuclear forces; theory of light nuclei; nuclear spectroscopy; special nuclear models; theory of nuclear reactions; theory of beta-decay. Prereq: 571.

626-27 Elementary Particle Physics (3,3) Survey in elementary particle physics covering experimental methods, conservation laws, invariance principles, and models of interactions. 627-Advanced topics: quark models, electroweak interactions and unification of elementary forces. Prereq: 522.

631 Advanced Topics in Relativity of Cosmology (3) Topics vary according to interests of students, instructor and present state of physics. Prereq: 531 and 561.

641 Advanced Topics in Classical Theory (3) To meet special needs of students. Advanced dynamics and hydrodynamics, electromotive force, statistical mechanics, or theory of nonequilibrium processes. Prereq: 532, 542, 551. May be repeated with consent of department. Maximum 9 hrs.

642 Advanced Topics in Quantum Theory (3) To meet special needs of students. Angular-momentum theory, beta-ray theory, theory of atomic spectra, molecular structure, and valence theory, theory of radiation, electric and magnetic susceptibilities, high energy processes, scattering and collision processes, or theory of fields. Prereq: 522. May be repeated with consent of 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, bond structure on solid state physics, transport problems in statistical mechanics, Monte Carlo simulation of liquids, fitting and interpolation of data, correlation analysis, or optimization strategy. Prereq: 532, 542, 551, and 572.

651-62 Molecular Spectroscopy (3,3) Spectroscopic methods of determining molecular properties, rotational, linear, and vibrational quantum mechanics and experimental aspects of infra- and inter-molecular energy and charge transfer, group theoretical methods and selection rules in gases and condensed phases, normal coordinates and potential functions, vibration-rotation interaction theory, intensities, frequencies and line shapes of molecular transitions. Prereq: 552 and 542, or consent of instructor.

Planning (College of Architecture and Planning)

MAJOR DEGREE
Planning ........................................ M.S.P.

James A. Spencer, Director

Professors:
Johnson, David A., Ph.D. .......... Cornell
Kenney, Kenneth B., Ph.D. ......... North Carolina
Prochaska, J. M., M.U.P. ......... Michigan State
Shouse, Walter L. (Emeritus), M.C.P. .... Harvard
Spencer, James A., M.C.P. ........ Ohio State

Associate Professors:
Bowen, George E., M.A. ........ George Washington
Fisher, Patricia, Ph.D. .......... Florida State

Assistant Professor:
Anderson, Annette, M.P.A. .......... Missouri (Kansas City)

The Graduate School of Planning offers a program of studies leading to the professional degree of Master of Science in Planning. The degree is the normal route for entry into professional positions in urban and regional planning. Graduates are candidates for positions in government, planning agencies, and metropolitan planning agencies; in local, state, and federal agencies concerned with physical, economic, and administrative planning; in private business and organizations dealing with development problems; and in private consulting.

The Master of Science in Planning program is accredited by the Planning Accreditation Board, a joint undertaking of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning.

THE MASTER'S PROGRAM

Admission Requirements
Applicants are to submit an application for admission to The Graduate School; two letters of reference from faculty familiar with their prior academic work, and a statement describing personal career objectives. If the applicant has prior work experience in planning, a reference letter should also be provided by the work supervisor. Graduate Record Examination scores are requested of all applicants whose undergraduate GPA is below 3.0. Other applicants are encouraged to submit them.

Degree Requirements
The M.S.P. requires completion of at least 48 hours of graduate credit, at least 50 of which must be in planning. The following courses are the core curriculum required of all students: 510, 511, 515, 520, 521, 523, 530, 531, 532, 540, and 545.

Students should plan to enter the program in the fall term to take the core courses in the proper sequence.

Each student is required to develop an area of concentrated competency beyond the core curriculum. After selecting the area of concentration, usually by the end of the second semester, the student takes a prescribed set of courses in the subject area. Further enhancement of the concentration is gained by taking additional elective courses in the subject and by focusing the thesis or major paper on the subject. Concentration courses are drawn from the planning curriculum and from other departments in the University. Concentrations have an explicit foundation in land use planning, analytical methods in planning, economic development planning, and real estate development planning.

Students have the latitude to propose an alternate specialization consisting of at least 9 hours of coursework chosen in consultation with a faculty committee. Courses are available in transportation, health, education, environmental, and social planning.

Each student is required to demonstrate competence in independent 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 the his/her committee for a major study that will include at least 6 hours of subsequent coursework. The proposal shall justify the selection of the topic, describe the approach to the problem, and describe the nature of the final product. The topic will normally be expected to reinforce or complement the student's concentration.

Student academic progress is monitored by the faculty. A student not maintaining an acceptable grade-point average may be placed on probation or dismissed from the program.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

401 The City in the U.S. (3) Development and character of U.S. cities. Contemporary issues and selected case studies. (Same as Urban Studies 401.)

402 Survey of Planning (3) History of city development and of planning; U.S. experience in urban and other levels of planning; State of the art; process, comprehensive plan, implementation devices. Planning issues in society. Not for credit for M.S.P. degree.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester. Consent of instructor 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 (2) History of planning, structure and development of urban areas, operations of contemporary planning, trends and issues.
511 Graphic and Oral Communications in Planning (1)
515 Theory of Planning (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) Research techniques in subject areas associated with city and regional planning. Research tools, data collection and analysis as basis for planning and decision-making.
521 Computers in Planning (3) Basic computer concepts, hardware and software, use of mainframe and microcomputers in planning and government.
522 Computers in Planning II (3) Software and systems for planning and local government. Content varies. Projects in small group or individual study mode. Prereq: 521 and consent of instructor.
523 Statistics for Planners (3) Applications of basic descriptive and inferential classical and non-parametric techniques in planning research. Data organization and display, measures of location, dispersion and association, data transformations; some basic probability theory; selected multivariate, non-parametric, and analytical techniques in planning research. Data organization and applied decision making. Prereq: 520 or consent of instructor.
524 Advanced Data Analysis (3) Applications of statistical data analysis in planning. Regression analysis, plus selected multivariate, non-parametric, and analytical graphic techniques. Use of computer packages for data analysis. Prereq: 521, 523 and consent of instructor.
526 Library Research for Planning (1) Survey of publications of interest to planners, resources and research techniques. Use of facilities and collections of libraries.
530 Planning Analysis and Forecasting (3) Methods of quantitative analysis and modeling in urban and regional studies. Population, employment, and economic base forecasting techniques. Coreq: 520 or consent of instructor.
531 Urban and Regional Analysis (3) Past, present and possible future patterns of urban and regional structures drawing on contemporary theories, models, and empirical research.
532 Planning Methods (5) Preparation of comprehensive plans for urban areas or regions. Development of baseline data and forecasts, formulation of alternative plans and strategies, and development of plan implementation programs. Extensive laboratory experience. Prereq: 510, 520, 530 and 531 or consent of instructor.
537 Planning and Transportation (3) (Same as Civil Engineering 559.)
538 Urban and Site Design (3-6) Principles of design of residential subdivisions and some components of physical community, shopping centers, institutional complexes, open space, and public open space planning. 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 planning processes, designation of sites, legislative needs, financing and administrative organizations.
540 Legal Aspects of Planning (3) Legal basis for planning and guiding community development. Legal tools of planning. Prereq: 510 or consent of instructor.
545 Planning and Property Development (2) Process of urban physical growth and change; functioning of private sector real estate development and its relationship to planning. Influence of public and private sector in urban development and redevelopment. Prereq: 510 or consent of instructor.
551 State and Regional Planning (3) Theory and practice of planning at state, sub-state, and metropolitan levels.
552 Development Planning in the Third World (3) Seminar on urban and regional development in Third World nations. Population growth, settlement patterns, economic development, land management of integrated resource management. (Same as Sociology 552.)
553 Natural Resource Management and Environmental Assessment in Developing Nations (3) (Same as Sociology 557 and Botany 507.)
554 TVA, Planning and Development (3) Review and evaluation of leading U.S. national experiment in river basin planning and development, Tennessee Valley Authority.
555 Environmental Planning (3) Role of planners and planning in maintenance of balance between natural and built environment. (Same as Sociology 555.)
560 Policy Analysis and Strategic Planning (3) Models of policy making process and role of strategic planning and applied decision making. Quantitative and qualitative approaches, evaluative and program evaluation, and impact assessment.
590 Practicum (6) Prereq: Consent of instructor. S/NC or letter grade.
591 Special Topics (1-3) Prereq: Consent of instructor.
592 Readings in Planning (1-3) Prereq: Consent of instructor. May be repeated.
593 Problems in Planning (1-3) Prereq: Consent of instructor.

Plant and Soil Science

(College of Agricultural Sciences and Natural Resources)

MAJOR

DEGREES

Plant and Soil Science ....................... M.S., Ph.D.

John E. Foss, Head

Professors:

Allen, Fred L., Ph.D. ................. Minnesota State
Bell, Frank F. (Emeritus), Ph.D. ...... Iowa State
Corley, D. L., Ph.D. ................. Purdue
Conger, B. V. (Distinguished Prof.), Ph.D. .... Washington State
Duck, B. N., Ph.D. .................. Auburn
Foss, John E., Ph.D. ................. Minnesota State
Frees, Edward L., Ph.D. .......... Iowa State
Hayes, R. M., Ph.D. ................ Illinois
Hoskinson, P. E., M.S. .............. Tennessee State
Howard, D. D., Ph.D. ............. Auburn
Josephson, L. M. (Emeritus), Ph.D. .... Wisconsin

Mullins, C. A., Ph.D. ................. Tennessee
Parks, William L. (Emeritus), Ph.D. ...... Purdue
Pickett, B. S. (Emeritus), Ph.D. ...... Michigan State
Raynolds, John H., Ph.D. .......... Wisconsin
Seatz, Lloyd F. (Emeritus), Ph.D. .... NC State
Skold, L. N. (Emeritus), M.S. ..... Kansas State
Springer, M. E. (Emeritus), Ph.D. ...... California
Swingle, H. D. (Emeritus), Ph.D. .... Louisiana State
Winter, Eric (Emeritus), Ph.D. ...... Illinois

Associate Professors:

Ammons, J. T., Ph.D. ................. West Virginia
Dayton, D. E., Ph.D. ............... NC State
Gravel, J. G., Ph.D. ............... Purdue
Krueger, W. A., Ph.D. .......... Illinois
Lee, S. Y. (Adjunct), Ph.D. .... Wisconsin
Lessman, Gary M., Ph.D. .... Michigan State
Lewis, R. J., Ph.D. ................. NC State
Miller, R. D., Ph.D. ............... Kentucky
Reich, V. H., Ph.D. ............... Iowa State
Sams, C. E., Ph.D. ............... Michigan State
Tyer, D. D., Ph.D. ............... Kentucky
West, R. D., Ph.D. ............... Nebraska
Wyatt, J. E., Ph.D. ............... Florida

Assistant Professors:

Easington, M. E., Ph.D. ............. California (Riverside)
Logan, Joanne, Ph.D. .......... Nebraska
Mueller, Thomas C., Ph.D. .... Georgia
Mullen, M. D., Ph.D. .......... NC State
Newton, D. (Adjunct), M.S. ...... Kentucky
Wilson, G. V., Ph.D. .......... Arkansas

The Department of Plant and Soil Science offers graduate programs leading to the Master of Science and the Doctor of Philosophy. Concentrations for the graduate programs are offered in soil science, plant breeding and genetics, and crop physiology and ecology. For further information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option

This option requires writing a thesis based on original research. Six hours of 500 Thesis are required. Prior to conducting research, the student must develop a detailed written research plan. In addition to the thesis hours, a minimum of 24 hours of graduate coursework is required, of which at least 14 must be taken in courses numbered 501 and above. The student’s advisory committee may require additional coursework if the student’s progress or background indicates such need. Each student is required to take 1 hour of 501 and 1 hour of 503, and to present an exit seminar on the thesis research.

The student’s advisory committee consists of the major professor, who acts as chairperson of the committee, and a minimum of two other faculty members. The advisory committee approves the student’s research problem and coursework and conducts the final oral examination integrating the thesis and coursework.

A student having started on the thesis option is not eligible to transfer to the non-thesis option after the first semester of graduate study or after having received a Graduate Research Assistantship stipend for more than one semester. A student having
started on the non-thesis option may transfer to the thesis option upon approval by a potential major professor and the Department Head.

Non-Thesis Option

A student desiring the non-thesis option should declare this intention at the beginning of the first semester of graduate studies, and must declare it in writing in the Dean’s Office. In lieu of thesis, students are required to complete 3 hours of 593 for satisfactory participation in a single research program for a period of 12 weeks and the writing of an original, creative, and significant report, both to be conducted by the major professor and approved by the advisory committee. In addition to the research program, a minimum of 30 hours of graduate coursework is required, of which at least 20 must be taken in courses numbered 501 or above. The student’s advisory committee may require additional coursework if the student’s progress or background indicates such need. Each student is required to take 1 hour of 501 and 2 hours of 503.

The student’s advisory committee consists of the major professor, who acts as chairperson of the committee, and a minimum of two other faculty members. The advisory committee approves the student’s coursework and the report on participation in a research program for the non-thesis student. Students are required to take a written comprehensive examination integrating the coursework.

THE DOCTORAL PROGRAM

A minimum of 72 hours beyond the Bachelor’s degree, exclusive of credit for Thesis 500, is required. Of this number, 24 hours must be Doctoral Research and Dissertation 600. A minimum of 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 department in one or more cognate areas.

The student and the major professor identify a doctoral committee composed of at least four faculty members holding the rank of assistant professor or above, three of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from outside the department. The committee must approve all coursework applied toward the degree, certify the student’s mastery of the major field and any cognate areas, direct the research, and recommend the dissertation for approval and acceptance by the Graduate School.

GRADUATE COURSES

411 Soil Microbiology (3) Soil microbial populations and role in soil ecosystem, microbial transformation of organic and organic compounds, decomposition of residues, dynamics of soil microbial communities. Introduction to Soil Science and Introduction to Organic and Biochemistry or Organic Chemistry or consent of instructor. 2 hrs and 1 lab. F.A.

412 Soil Genesis, Classification, and Mapping (3) Soil genesis and formation; observing and describing morphology of agricultural and forest soils; chemical and physical properties of soils; soil survey. Two Saturday field trips. Prerequisite: 210 or consent of instructor. 2 hrs and 1 lab. Sp.

413 Soil Chemistry (3) Principles concerning structure and well-written report, both to be related as exchange, chemical equilibrium, soil acidity, oxidation-reduction, weathering, nutrient availability and waste disposal. Prerequisite: 311 or consent of instructor. F.A.

414 Soil, Land Use, and the Environment (3) Soil as environmental component and soil properties affecting land use. Soil as resource in development planning; consideration of nonengineering aspects of site selection for land use, soil survey and resource data in land use, recognition and prevention of soil pollution. Prerequisite: 210 or consent of instructor. F.A.

431 Crop Physiology and Ecology (3) Principles of plant physiology and ecology as applied to crop production. Effects of environmental factors on physiological processes. Prerequisite: 230, Botany 321, 2 hrs and 1 lab. F.A.

432 Bioclimatology (3) Solar energy budget; interactions between global, regional and local climates and environmental factors; quantification of macro- and microclimates; microclimates and their modification; automated weather station data collection and analyses; biological responses to climatic stresses; climate variations and change and their effects on biological systems. Prerequisites: 1 yr physical or biological science, junior standing. 2 hrs and 1 lab. F.A.

433 Agricultural Pesticides (3) Regulation of pesticide development, manufacture, transportation, marketing and use; soil density, moisture, temperature and environmental impact of pesticides used in agriculture, forestry, and related areas. Prerequisite: 1 yr biological science and statistics. 2 hrs and 1 lab. F.A.

453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Prerequisite: Botany 220 or equivalent; 2 hrs and 1 lab. Sp.

471 Statistics for Biological Research (3) Application of statistical and research methodology. Description, descriptive statistics, probability, distributions, confidence intervals, and chi-square tests, analysis of variance, mean separation procedures, linear regression and correlation. Prerequisite: Mathematics 121 or equivalent. F

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.Sp.

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

503 Seminar (1) Presentations and discussion of current scientific material. May be repeated. Maximum 5 hrs. F.Sp.


512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming processes. Prerequisite: 412 or consent of instructor. 2 hrs and 1 lab. F.A.

514 Soil Physics (3) Physical and chemical relationships among solid, liquid and gaseous phases of soil systems. Dynamics, interactions and interaction of phases of soil; soil characteristics, aeration and relationship to plant growth. Prerequisite: 413 or consent of instructor. 2 hrs and 1 lab. F.A.


532 Advanced Crop Ecology (3) General and specific relationships among environmental factors, crop organisms, and agricultural systems; quantification of macro- and microclimatic influences on interrelationships and their interaction. Prerequisite: 471 or equivalent; 431 or equivalent. F,Sp.

551 Advanced Plant Genetics (3) Discovery of genetics: controlling elements, induced mutations, genome organization, polyploidy, tetrasomic inheritance, extra-chromosomal inheritance, apomix, incompatibility systems, and genetic engineering of higher plants. Prerequisite: 220. F.A.


571 Design and Analysis of Biological Research (3) Graduate Seminar in Statistical Methods for Research (3-15) P/NP only.

601 Special Topics in Soil Science (1-3) Thermodynamics and molecular solutions; clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants; soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E

603 Special Topics in Crop Physiology and Ecology (1-3) Microclimatology of agroecosystems, crop dormancy and responses to stress, physiology of crop growth and reproduction, interactions of physiology and genotypic interactions in crop production, theory and application of quantitative methods in crop physiology and ecology research. May be repeated. Maximum 6 hrs. E

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyplody, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 6 hrs. E

613 Advanced Soil Chemistry (3) Surface and colloid chemistry of soil and soil management developments in soilication, ion movement, surface charge, surface complexation and soil colloidal stability. Prerequisite: 413 or consent of instructor. Sp.


633 Plant Growth Control and Herbicide Action (3) Principles of uptake, translocation, mode of action and uses of herbicides and plant growth regulators and their effects on plant morphology, metabolic systems and enzymatic activities. Practical aspects and current commercial uses of plant growth regulators. Prerequisite: Botany 521 and 522 or equivalent. F.A.

653 Advanced Plant Breeding (4) Development and evaluation of cultivars and genotypes; quantitative parameters, inbreeding, heterosis, methods of selection, in vitro breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prerequisites: 453 and 571 or equivalent or consent of instructor. 3 hrs and 1 lab. Sp.

571 Advanced Research Planning (3) Development of advanced research proposals, utilizing prescribed resources and emphasizing experimental design and statistical techniques. Prerequisite: 571, Animal Science 572. Statistics 461, or equivalent. (Same as Animal Science 671). F.A.

Political Science (College of Liberal Arts)

MAJORS

DEGREES

Political Science ............................ M.A., Ph.D.


Michael Gant, Head
THE MASTER OF PUBLIC ADMINISTRATION PROGRAM

The M.P.A. program is intended to prepare students for public service careers by acquainting them with management principles, analytical tools, and the ethical dilemmas they will face as public administrators. It consists of a total of 36 semester hours, including a core program, an elective specialization, and a recommended internship.

Applicants for admission to the program must have a Bachelor's degree or its equivalent. Normally, an overall average of 3.0 and an average of 3.2 in the last two years of political science or social science courses is required. In addition, a composite score of at least 1.100 on the verbal and quantitative parts of the GRE is normally required.

The M.P.A. is a non-thesis program. Specific requirements include the following:

1. Core - 21 hours.
   b. General perspectives - elective courses (3 hours). 556 Policy Analysis; 558 The Politics of Administration.
   c. Analytical skills (6 hours). 512 Quantitative Political Analysis; 514 Research and Methodology in Public Administration.
   d. Management skills (6 hours). Choose two of the following: 560 Public Budgeting and Finance; 562 Public Management; 564 Human Resources Management in Public Organizations.

2. Specialization - 9 hours.
   A specialization is designed by the student in consultation with the coordinator of the M.P.A. program. Possible specializations include general government, budgeting and finance, planning, natural resources, program evaluation, criminal justice, public relations, personnel, and others.

3. Recommended internship with a public agency - 6 hours.

Internships are arranged in consultation with the coordinator of the M.P.A. program.

4. A written final examination, which may be followed by an oral examination, is required.

DUAL J.D.-M.P.A. PROGRAM

The College of Law and the Department of Political Science in the College of Liberal Arts offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would be required. Students pursuing the dual degree program should plan to be enrolled in coursework or an internship for one summer term in addition to taking normal course loads for four academic years.

Admission

Applicants for the J.D.-M.P.A. program must make separate application to, and be independently accepted by, the College of Law for the J.D. degree and the Department of Political Science and The Graduate School for the M.P.A. degree. Applicants must also be accepted by the Dual Degree Committee. All applicants must submit a Law School Admission Test (LSAT) score. An applicant's LSAT score may be substituted for the Graduate Record Examination (GRE) score, which is normally required for admission to the M.P.A. program. Application may be made prior to or after matriculation in either the J.D. or the M.P.A. program, but application to the dual program must be made prior to entry into the last 29 semester hours required for the J.D. degree and prior to entry into the last 15 hours required for the M.P.A. degree.

Curriculum

A dual degree candidate must satisfy the requirements for both the J.D. and the M.P.A. degrees, as well as the requirements for the dual program. The College of Law will award a maximum of 9 semester hours of credit toward the J.D. degree for successful completion of approved courses offered by the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821) and are encouraged to take Local Government (Law 824). An internship is strongly recommended for students in the dual degree program, as it is for all M.P.A. candidates, but an internship is not required.

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the M.P.A. program. During 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 fall of their fourth year, students are strongly encouraged to take both law and political science courses each semester.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

Awarding of Grades

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be computed in determining a student's GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of 2.0 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 grades assigned by the instructor without conversion.

DUAL M.S.S.W.-M.P.A. PROGRAM

The Department of Political Science and the College of Social Work offer a dual degree program leading to the conferment of both the
Master of Science in Social Work and the Master of Public Administration degrees. In this program, the M.P.A. and M.S.S.W. degrees can be earned on a full-time basis in five consecutive terms rather than seven to eight terms.

Admission
Applicants for the M.S.S.W.-M.P.A. program must be admitted to the College of Social Work and to the Department of Political Science. In addition, applications from dual degree students must be reviewed and approved by the dual degree committee that is responsible for overseeing the program. It is anticipated that some students may apply to the dual degree program before they matriculate in either the M.S.S.W. or the M.P.A. program. Students already enrolled in one program will also be permitted to apply, but must do so prior to the end of the first year of study.

Curriculum
Students in the dual degree program are required to take a set of core courses from each curriculum, but the program is designed to be flexible, providing students the opportunity to develop special areas of competence. For the dual degree program, a minimum of 65 hours are required (35 hours must be in social work and 30 hours must be in public administration). Admission to candidacy will be completed separately for each degree.

A comprehensive examination is required in each discipline for students receiving the dual degrees. A faculty committee from Public Administration and one from Social Work will write and grade the respective examination.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the M.P.A. or the M.S.S.W. degree for courses taken in the other program, except as such courses qualify for credit toward a degree independent of the dual degree program.

Financial Aid
Students may apply for financial aid to both the College of Social Work and the Department of Political Science. Normally, students will not receive funding from both programs concurrently.

THE DOCTORAL PROGRAM
The Ph.D. program prepares students for careers in college teaching, as well as careers in other occupations related to service in the public or private sectors. Applicants for admission to the program should normally have completed a Master's degree in political science or a related field with a 3.0 GPA (3.5 for international students) and have earned a composite score of at least 1100 on the verbal and quantitative parts of the Graduate Record Examination.

Students admitted to the program must complete 78 hours of course work beyond the completion of the dissertation. This requirement may be satisfied either by demonstrating competency in one foreign language, or by completing 12 hours of coursework, numbered 500 or above, in empirical methodology.

In addition, students must satisfy a research tool requirement. This requirement may be satisfied either by demonstrating competency in one foreign language, or by completing 12 hours of coursework, numbered 500 or above, in empirical methodology.

In addition to the total hours required for the degree, the following requirements must also be met:
1. At least 63 hours must be in political science courses.
2. At least 48 hours in political science courses must be in courses numbered 500 or above.
3. Completion of Political Science 510 and 512.
4. At least 6 hours must be earned in political science courses numbered above 600, exclusive of dissertation hours.
5. A total of 24 hours must be earned by writing the dissertation.

GRADUATE COURSES
410 Special Topics in Political Science (3) May be repeated with consent of department. Maximum 6 hrs.
420 Political Attitudes and Opinions (3) Nature, formation, development, and dissemination of politically relevant attitudes and opinions in American political system.
421 Political Parties and Interest Groups (3) Examination of political parties and organized groups in American politics and government.
422 Political Campaigns and Elections (3) Analysis of nature of campaigns and elections in American political process.
423 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.
451 U.S. Constitutional Law: Civil Rights and Liberties (3) Analysis of current issues in civil rights and liberties including: first amendment freedoms, equal protection, privacy and rights of accused.
440 Public Management and Human Resources (3) Mobilization and management of technical and human resources in pursuit of public sector organization goals.
441 Budgetary Process and Financial Management (3) Fiscal planning, budget and expenditure process in government, their policy and administrative implications.
442 Administrative Law (3) Legal dimensions of administrative power and procedures, and constitutional controls over administrators.
452 Black African Politics (3) Recent evolution and current political environment of Black African nations.
454 Government and Politics of China and Japan (3) Examination of the political setting, structure and political processes in China and Japan.
455 Latin American Government and Politics II (3) Selected topics on Latin American political dynamics, consideration of theoretical explanations. (Same as Latin American Studies 455.)
459 Government and Politics of the Soviet Union (3) Origins and development of Soviet polital system, and study of selected policy areas.
460 Revolution (3) Examination of characteristics, theories, and consequences of revolution with particular focus on left-wing revolutions and movements.
461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policy.
463 Contemporary Middle East Politics (3) Government and movements in Middle East, their characteristics, bases, and interrelationships.
469 Soviet Foreign Policy (3) Overview of Soviet international behavior since 1917 and examination of selected problems of Soviet foreign policy post World War II.
470 International Law (3) Nature and development of international law and thinking from Machiavelli to Marx.
475 Ancient and Medieval Political Thought (3) Survey of major western political thinkers from Socrates to Marsilio of Padua.
476 Modern Political Thought (3) Survey of major western political thinkers from Machiavelli to Marx.
500 Thesis (1-15) P/N only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 6 hrs. E
510 Scope and Methods in Political Science (3) Procedures of analysis in political science.
512 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: univariate and bivariate statistics.
513 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: multivariate modeling.
514 Research and Methodology in Public Administration (3) Basic techniques and techniques of research in public administration: measurement, analysis, and reporting of data.
520 Political Theory (3) Survey of major ideas, thinkers and works of Western political theory.
530 Topics in American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overviews of research in various subfields. May be repeated with consent of department. Maximum 9 hrs.
538 Urban Politics and Administration (3) American urban structure and public policies. May be repeated with consent of department. Maximum 9 hrs.
540 Public Law (3) Selective examination of published research and current approaches in subfields of constitutional law, judicial process, and judicial behavior. May be repeated with consent of department. Maximum 9 hrs.
548 Law and the Administrative Process (3) Constitutional position, decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. May be repeated with consent of department. Maximum 9 hrs.
550 Public Administration (3) Overview of public administration theory and function.
552 Organization Theory (3) Appraisals of organizational behavior and their applicability to public sector.
556 Policy Analysis (3) Role of administrators in policy analysis and decision making. May be repeated with consent of department. Maximum 9 hrs.
558 The Politics of Administration (2) Examination of public administration in context of American political system, policy making and political roles of public administrators and agencies. May be repeated with consent of department. Maximum 9 hrs.
560 Public Budgeting and Finance (3) Technical and political aspects of planning, preparing and adopting government budgets. Management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing risk management, post-auditing.
562 Public Management (3) Interpersonal and leadership skills, techniques and methods for planning, decision making, and implementation of management strategies in public sector. May be repeated with consent of department. Maximum 9 hrs.
566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.
569 Internship in Public Administration (3-9) Open to students participating in approved internship programs. May be repeated with consent of department. Maximum 9 hrs. S/N/C only.

570 Comparative Government and Politics (3) Selected topics in modern governments. May be repeated with consent of department. Maximum 9 hrs.

572 The Politics of Development (3) Selected topics dealing with political problems of less developed countries. May be repeated with consent of department. Maximum 9 hrs.

574 Area Seminar in Comparative Government and Politics (3) Selected topics in area studies: African, 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 page 31.

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

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

595 Readings and Special Problems in Political Science (1-3) Freely. Consent of instructor may be repeated. Maximum 15 hrs.

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

610 Special Topics in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science. May be repeated with consent of department. Maximum 9 hrs.

620 Special Topics in Political Theory (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

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.

631 Topics in Parties and Elections (3) Analysis of party systems and electoral behavior. May be repeated with consent of department. Maximum 9 hrs.

634 Topics in American National Institutions (3) Deals with congress, executive or related subjects. May be repeated with consent of department. Maximum 9 hrs.

636 Comparative State Politics (3) Government and political processes of fifty states; general and particular characteristics. May be repeated with consent of department. Maximum 9 hrs.

640 Special Topics in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy. May be repeated with consent of department. Maximum 9 hrs.

642 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and public policy formulation: criminal process; law enforcement administration; criminal court administration; and prison administration. May be repeated with consent of department. Maximum 9 hrs.

654 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. May be repeated with consent of department. Maximum 9 hrs.

667 Comparative Public Administration (3) Comparative and cross-cultural studies and public policies in selected countries. May be repeated with consent of department. Maximum 9 hrs.

668 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

670 Special Topics in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

692 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 Liberal Arts)

MAJOR DEGREES
Psychology ........................................, M.A., Ph.D.

Warren H. Jones, Head

Professors:
Burghardt, Gordon M., Ph.D. ............ Chicago
Burstein, Alvin G., Ph.D. .............. Chicago
Calhoun, William H., Ph.D. .......... California
Cohen, Charles P., Ph.D. ............ Kansas
Cureton, Edward E. (Emeritus), Ph.D. Columbia
Fine, Harold J. (Emeritus), Ph.D. ...... Syracuse
Fowler, Raymond D. (On Leave), Ph.D. Penn State
Handel, Stephen J., Ph.D. .......... Johns Hopkins
Handler, Leonard, Ph.D. .......... Michigan State
Johnson, Michael G., Ph.D. .......... Johns Hopkins
Jones, Warren H., Ph.D. .......... Ohio State
Lawler, James E., Ph.D. .......... North Carolina
Lawler, Kathleen A., Ph.D. .......... North Carolina
Lounsberry, John W., Ph.D. .... Michigan State
Lubar, Joel F., Ph.D. .......... Chicago
Malone, John C., Ph.D. .......... Duke
Newton, Kenneth R. (Emeritus), Ph.D. Pennsylvania State
Pollio, Howard R. (Distinguished Prof.), Ph.D. .... Michigan
Samejima, Fumiko, Ph.D. .......... Michigan
Saudargas, Richard S., Ph.D. .... Florida State
Shadrac, Richard J., Ph.D. ........ University of Alabama
Travis, Cheryl B., Ph.D. .......... California (Davis)
Verplanck, William S. (Emeritus), Ph.D. Brown
Wahler, Robert G., Ph.D. .......... Washington
Wiberley, J. Albert (Emeritus), Ph.D., Syracuse

Associate Professors:
McIntyre, Anne, Ph.D. ............ Yale
Morgan, Wesley G., Ph.D. .......... Tennessee
Nash, Michael R., Ph.D. .......... Ohio

Assistant Professors:
Baldwin, Deborah R., Ph.D. .... Kent State
Hopson, Ronald E., Ph.D. .... Michigan State

THE MASTER'S PROGRAM
Graduate study leading to the Master of Arts in general psychology is normally available only to students in the doctoral program in psychology. Requirements are (1) a score of at least 630 on the GRE in psychology; (2) at least 30 hours of graduate-level courses in psychology; and (3) a Master's thesis based on 6 hours of Thesis 500. A non-thesis Master's degree is available with the approval of the student's supervisory committee upon successful completion of a total of at least 36 hours in graduate-level courses in psychology and a final written examination.

THE DOCTORAL PROGRAM
A student with a B.A. or B.S. may apply to the Department of Psychology for admission to the doctoral program with a concentration in general psychology or clinical psychology. The doctoral program with a concentration in ethology or physiology is offered through the Life Sciences Program. Doctoral study in industrial and organizational psychology is offered through the intercollegiate Program in Industrial and Organizational Psychology, to which application is made through the Department of Management.

Departmental Requirements
All students in the doctoral program in psychology must obtain a score of at least 630 on the GRE in psychology by the end of the first year, and all students must pass the departmental general psychology examination (a comprehensive, two-day essay exam offered twice each year) by the end of the second year. In addition, each student must pass the doctoral comprehensive examination; complete an acceptable doctoral dissertation; and conduct a satisfactory oral defense of the dissertation. All doctoral students must complete a minimum of 78 hours of graduate-level courses, including courses required by their program; at least 6 hours in courses outside of psychology; and at least 24 hours of dissertation research (Psychology 600).

General Psychology
This program allows students to select from a variety of specializations oriented toward careers in research and teaching in psychology in academic, institutional, or industrial settings. The program is flexible and individualized and seeks to provide a professional apprenticeship. Specializations include behavioral medicine and health psychology, child and adolescent development, cognitive and symbolic processes, conditioning and learning, ethology, existential phenomenology, psychometrics, psychophysiology, social psychology, and others. Requirements of the program are as follows:
1. Statistics 537-38, or equivalent, and two additional courses numbered above 500 in research methodology, quantitative methods, statistics, or psychometrics.
2. Competence in general psychology, demonstrated by passing approved Psychology 513 (Foundations of Psychology) or Psychology 420 (History and Systems of Psychology) or equivalent, plus at least one course or sequence or equivalent from four categories in the following list. (This requirement may be met by passing approved written examinations.)
   a. Biological psychology: 461-69 Physiological Psychology and Laboratory; 526 Neuroanatomy: 527 Behavioral Neurology
   b. Comparative and ethical psychology: 450-59 Comparative Animal Behavior and Laboratory in Comparative Animal Behavior; 546, Ethological Psychology.
409 Group Facilitation (3) Study of theory and technique through supervised experience in small groups. Prereq: 359 and consent of instructor. May be repeated. Maximum 6 hrs.


424 Psychology and the Law (3) Psychological aspects of legal systems. Prereq: 110 or equivalent, upper division standing and consent of instructor.

430 Health Psychology (3) Survey of psychological factors related to health and illness: stress, personality, and environment. Applications of psychological treatments to physical illness. Prereq: 110 or equivalent, 210.

434 Psychology of Gender (3) Biological, psychological, and social factors in gender. Importance of gender roles and stereotypes for behavior and experience. Prereq: 110 or equivalent, 210, 220. (Same as Women's Studies 434.)

440 Organizational Psychology (3) Social-psychological analysis of organizations, role-theory and systems theory. Prereq: 360.


450 Comparative Animal Behavior (3) (Same as Zoology 450.)

459 Comparative Animal Behavior Laboratory (3) Coreq: 450. (Same as Zoology 459.)

461 Physiological Psychology (3) Nervous system and physiological correlates of behavior. Biological basis of emotion, learning, memory and stress. Prereq: 110 or equivalent, 210, and 1 yr of biology or zoology introductory sequences or equivalents.

469 Laboratory in Physiological Psychology (3) Laboratory experience in the study of basic and physiological correlates of behavior. Coreq: 461.

470 Theories of Personality (3) Survey of major theories of human personality and their development. Prereq: 220 and 330 or 331.

480 Theories of Learning (3) Classical and current approaches to learning and cognition. Prereq: 310.

482 Topics in Psychology (3) Intensive analysis of special topics: Afro-American psychology or evaluation of programs in community. Prereq: Biological Basis of Behavior or Behavior and Experience: Humanistic Psychology and at least 9 hrs in 300-level courses. Recommended prereq: Statistics in Psychology, Methods of Research in Psychology. May be repeated. Maximum 6 hrs.

489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs in 399, 489, 491, 492, and 493 combined may apply toward undergraduate major.

500 Thesis (1-3) Pr/NP only. E

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when he/she 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 Research Design (3) Techniques for planning and conducting research in controlled and natural settings: experiments, quasi-experiments, observational studies, surveys, and program evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity. Prereq: Consent of instructor.

508 Readings and Special Issues in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

509 Research Practicum (1-3) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs. S/NC only.

510 Topics in Psychology (3) Intensive examination of selected issues in psychology. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

511 Developmental Psychology (3) Normal processes of human socialization; physical, cognitive, and emotional development from conception through infancy, childhood, and adolescence. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

512 Life-Span Development (3) Theories and research concerning normal human development throughout life, adulthood and old age. Prereq: Consent of instructor.

513 Foundations of Psychology: Biological Factors, Perception, Learning, Thinking, Motivation (4) Intensive survey. Prereq: Consent of instructor.

516 Colloquium in Ethology (1) Current research and theory. May be repeated. Maximum 9 hrs. (Same as Zoology 516.) S/NC only.

517-18 Proseminar in Industrial and Organizational Psychology (3,3) (Same as Management 567-68.)

520 Interventions for Behavioral Change (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Interventions by people in community: teachers or supervisors. Token economies and strategies for self-control. Prereq: Consent of instructor.

525 Laboratory Techniques and Instrumentation (3) Procedures for laboratory research involving human and nonhuman animals; techniques for collecting, transforming, storing, and retrieving data using microcomputers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

526 General Vertebrate Neuroanatomy (3) Lecture and laboratory. Structure and functioning of central and peripheral nervous system. Prereq: 461, 469, or equivalent and consent of instructor. (Same as Zoology 526.)

527 Behavioral Neurology (3) Disorders of nervous system, organic brain dysfunctions. Diagnosis and treatment. Prereq: Consent of instructor.

528 College Teaching in Psychology (3) Concepts, techniques, and materials for teaching psychology at college and/or university level. Supervised practice. Prereq: Consent of instructor. S/NC only.


545 Advanced Animal Behavior (3) (Same as Zoology 545.)

546 Ethological Psychology (3) Basic ethology and contemporary psychological applications for human behavior. Prereq: Consent of instructor.

549 Internship in School Psychology (1-6) (Same as Educational and Counseling Psychology 549.)

550 Social Psychology (3) Survey of theory and research concerning interpersonal interaction and individual behavior in social context. Prereq: Consent of instructor.

555 Psychometrics (3) Basic concepts: factor analysis, scaling, test theory, probability models and their applications, computerized adaptive testing and other topics. Prereq: Statistics 537-538 or equivalent. May be repeated. Maximum 6 hrs.

556 Theory of Mental Measurement (3) Classical and modern test theory. Reliability, validity, item and test-characteristic functions, information functions and other topics. Prereq: 555 and consent of instructor. May be repeated. Maximum 6 hrs.

557 Applied Psychological Measurement (3) Issues and techniques in applying psychological measurement in organizational, clinical, and community research. Prereq: Statistics 537-538 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

560 Psychology of Learning (3) Review of current evidence from research involving human and/or nonhuman animals. Prereq: 400 and consent of instructor. May be repeated. Maximum 6 hrs.
570 Personality: Theory and Research (3) Advanced survey of psychodynamic and neo-Freudian approaches to personality; related research. Prereq: 470 or equivalent.

571 Personality: Theory and Research II (3) Advanced survey of behavioral and humanistic approaches to personality; related research. Prereq: 470 or equivalent.

572 Descriptive Psychopathology (2) Diagnostic criteria of the DSM-III. Examples from written case-histories and recorded interviews. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

573 Dynamics of Psychopathology (3) Psychodynamic view of the causes and symptoms of major psychoses, neuroses, and adjustment disorders. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

574 Atypical Development in Childhood (3) Research on etiologies of atypical patterns of development in infancy and childhood. Prereq: 511 and consent of instructor. May be repeated. Maximum 6 hrs.

576 Object Relations (3) European and American conceptions of normal and psychopathological development of object relations. Significance for psychodynamic, psychoanalytic, and psychosomatic therapy. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

578 Clinical Aspects of Human Sexuality (3) Variation in human sexual behavior. Theories of etiology, treatment. Prereq: Consent of instructor.

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

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

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

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

594 Psychological Assessment I (3) Basic concepts and techniques of adult assessment: intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

595 Psychological Assessment II (3) Basic concepts and techniques of adult assessment, intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology and 594 or consent of instructor.

596 Laboratory in Psychological Assessment (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 12 hrs.

597 Evaluation of Development in Childhood (3) Structured and projective tests and interview techniques for evaluation of intellectual, personality, and social development in childhood. Prereq: 511 and admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

600 Doctoral Research and Dissertation (3-15) Prereq: Consent of instructor. May be repeated. Maximum 60 hrs.

620 Seminar in Social and Organizational Psychology (3) Prereq: 440 or 550 and consent of instructor. May be repeated. Maximum 12 hrs.

622 Seminar in Comparative and Ethological Psychology (3) Prereq: 540 or consent of instructor. May be repeated. Maximum 12 hrs.

623 Seminar in Methods of Naturalistic Research (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

624 Seminar in Psychometrics (3) Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

625 Seminar in Organizational Psychology (3) (Same as Management 665.)

626 Seminar in Industrial Psychology (3) (Same as Management 626.)

627 Seminar in Applied Industrial Psychology (3) (Same as Management 627.)

635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Educational and Counseling Psychology 635.)

638 Current Topics in Industrial/Organizational Psychology (3) (Same as Management 638.)

661 Advanced Psychometrics (3) Construction and standardization of psychological tests, questionnaires, rating scales, the theory of errors of measurement, item analysis, scaling, equating, and development of norms: latent trait models; factor analysis; and other topics. Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

668 Seminar in Psychopathology (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 12 hrs.

670 Psychodynamic Psychotherapy I (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

671 Psychodynamic Psychotherapy II (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology and 670 or consent of instructor.

673 Laboratory in Psychotherapy (2) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 670 or 671. May be repeated. Maximum 6 hrs. S/NC only.

674 Group Psychotherapy (3) Theory and practice. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. May be repeated. Maximum 6 hrs.

675 Inference in Psychotherapy (3) Uses of actuarial data for assessment of strategies and tactics in psychotherapy. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

696 Advanced Psychology Clinic Placement (1-3) (Same as Management 690.)

699 Field Work in Industrial and Organizational Psychology (1-12) (Same as Management 660.)

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.

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.

Religious Studies (College of Liberal Arts)

Charles H. Reynolds, Head

Professors:

Dungan, David L., Ph.D. ................. Harvard

Humphreys, W. Lee, Ph.D. ............. Union

Linge, David E., Ph.D. ................. Vanderbilt

Lusby, F. Stanley, M.Div. ............. Colgate Rochester

Norman, Ralph V., Jr., Ph.D. ......... Harvard

Reynolds, Charles H., Ph.D. .......... Harvard

Associate Professors:

Fitzgerald, James L., Ph.D. ............ Chicago

Gwynne, Rosalind W., Ph.D. .......... Washington

Hackett, Rosalind I., Ph.D. .......... Aberdeen

Hodges, John O., Ph.D. ............... Chicago

Levering, Miriam L., Ph.D. .......... ... Harvard

Assistant Professors:

Tober, Linda (Adjunct), Ph.D. ......... Vanderbilt

A Master's degree in Philosophy with a concentration in religious studies is available. (Details of this program are described under Philosophy.) Graduate courses in religious studies provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

GRADUATE COURSES

411 Modern Religious Philosophies (3) Implications of major Western thinkers and movements from Nicholas 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. (Same as Philosophy 412.)

416 Jesus and Paul Compared (3) Central ideas and concepts of each person compared with equivalent concepts in the other. Advanced study of Gospels and Epistles of Paul, involving extensive independent research.

425 Seminar in Western Religions (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

430 Seminar in American Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

435 Seminar in Asian Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

440 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content
The Department of Romance Languages offers two advanced degrees: the Master of Arts in French and in Spanish and the Doctor of Philosophy in Modern Foreign Languages.

Inquiries should be addressed to the head of the department. The head, through the coordinators of Spanish and French, will make available further departmental requirements, regulations, and materials not listed below.

THE MASTER'S PROGRAM

Thesis Option
1. Completion of a minimum of 24 semester hours in coursework plus at least 6 hours in course 500 Thesis. In French, 501 is required; in Spanish, 550. A maximum of 6 hours may be taken at the 400 level, the rest at the 500 level, and under certain conditions the student may take 600-level seminars. If the student chooses to have a minor (such as Italian or Portuguese), at least 24 hours (including 6 hours of thesis) must be taken in the major, 6 in the minor.
2. A thesis, with a minimum of 6 semester hours in course 500.
3. A written examination covering the coursework and selected items from a master reading list.
4. A final oral examination covering the thesis.

Non-Thesis Option
1. Completion of at least 30 semester hours, with a maximum of 9 at the 400 level, the rest at the 500 level (including 501, 502, 503, 515, 516, 520, 550), and 6 in the minor.
2. Three term papers that have been accepted by the student's advisory committee.
3. A written examination covering the coursework and selected items from a master reading list.
4. A final oral examination to discuss the papers (French M.A. only).

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

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

Requirements for the Ph.D.
Candidates must complete a minimum of 63 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program consists of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); German 512 (3), French 512 (3), or Spanish 512 (3) and between 515-516 (2,2) or German 520 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists of at least 15 hours of courses beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. Cognate Field: Six hours must be in graduate courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized measures that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).

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

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

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, subject to staffing needs.
426 Methods of Historical Linguistics (3) (Same as German 426, Russian 426, Spanish 426 and Linguistics 426.)

429 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)

430 Theatrical French (2-3) Performance in one or more French plays. Prereq: 212; 218 or equivalent and consent of instructor. May apply toward major.

431 Highlights of French Civilization (3) Survey of French civilization from the Gauls to World War II. Historical events, daily life, all forms of arts. Prereq: 212, 218 or equivalent.

432 Contemporary French Culture (3) French contemporary civilization and culture since World War II. Problems, trends, and organization of French society today. Prereq: 212; 218 or equivalent.

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: Intermediate French or equivalent.

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

501 Techniques in Literary Analysis (2) Required for M.A. program. Intensive course in explication de texte. A close stylistic analysis of texts representative of different eras and of different genres.

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

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and 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 heading Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.

515-16 Bibliography and Methods of Research (2,2) Survey of critical research tools and scholarly contributions in French literature and language. Practical exercises on compiling of scholarly data.

521-22 Old French (3,3) Medieval French language and literature through history and development of Old French. Close reading of major texts from medieval genres, hagiography, epic, romance, lyric poetry, drama.

531 French Literature of the 16th Century I (3) Literature of first half of 16th century, Rabelais and other prose writers, humanists, and poetry of Marot, Lyonnais group, and young Pèlerins d'Avignon.

532 French Literature of the 16th Century II (3) Literature of second half of 16th century, mature works of Pèlerins writers and such poets, as d'Auiguède and Sponde, Montaigne; writers of scientific works and memorialists; drama.

541 French Literature of the 17th Century I (3) French poems and prose works of 17th century.

542 French Literature of the 17th Century II (3) Classical French theatre of 17th century.

551-52 French Literature of the 18th Century: the Philosophes (3,3) Textual analysis of works of Voltaire, Diderot, Rousseau, and other major French 18th-century writers.

559 Problems in Linguistics: Romance Languages (3) Maximum 6 hrs with consent of department. (Same as Spanish 559 and Linguistics 559.)


571-72 Trends in Modern French Literature (3,3) In-depth study of some of most revolutionary, challenging poets, novelists, dramatists of 20th century.
Spanish

GRADUATE COURSES

421 Phonetics (3) Prereq: 212, or 218 or equivalent.

422 Advanced Grammar (3) Finer points of grammatical structures. Required of all majors. Native speakers must receive consent of instructor. Prereq: 212, or 218 or equivalent.

423-24 Advanced Conversation and Composition (3,3) Advanced conversational and written skills in Spanish for pre-professionals.

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

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

429 Romance Linguistics (3) (Same as French 429 and 429.)

431 Spanish Civilization (3) Major social, political, and cultural achievements of Spanish people from origins of their civilization until today. Prereq: 311, 312 or equivalent.

432 Cervantes (3) Selections from Don Quixote and study of shorter Novelas ejemplares. Prereq: 311, 312 or equivalent.

433 Masterpieces of Spanish Literature (3) Selections from both Golden Age and modern period of outstanding writers. All historical survey from 16th to 20th century. Prereq: 311, 312 or equivalent.

435-36 Survey of Spanish Literature (3,3) 435—Spanish literature through Golden Age. 436—Spanish literature since 1700. Prereq: 311, 312.

450 20th-Century Hispanic Theatre (3) Major 20th-century Spanish American dramatists. Prereq: 311, 312 or equivalent.

459 Capstone Colloquium in Spanish (3) Integrative experience. Broad range of issues and topics that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Prereq: 311, 312 or equivalent.

460 Capstone Tutorial in Spanish (1) Independent study project supervised closely by faculty member. Prereq: 311, 312, 459 or equivalent.

471 Latin American Civilization (3) Latin America's diverse heritage and major social and political institutions. Prereq: 311, 312 or equivalent.

472 Masterpieces of Spanish American Literature (3) Close reading of selected works by major Spanish American writers, Dario, Paz, Borges, Fonteras and others. Genres and periods vary. Prereq: 311, 312 or equivalent.

473-74 Survey of Spanish American Literature (3,3) 473—Historical survey from Conquest to late 19th century. 474—Major literary movements, writers and works of 20th century. Prereq: 311, 312 or equivalent.

479 Social Protest Literature of Latin American (3) Analysis of literature as means of unmasking social ills that have traditionally beset Latin America. Indigenismo, Black literature, women writers, role of writer in Latin American society. Prereq: 311, 312 or equivalent.

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

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

512 Teaching a Foreign Language (3) Practical application of methodology for teaching and evaluating basic language skills and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.

522 Advanced Communication Skills for Teachers and other Professionals (3) Advanced use of oral and written proficiency in Spanish through extensive use of authentic contemporary materials; class lectures and discussions; oral and written presentations and reports. Especially recommended for graduate students, teachers and other professionals seeking to enhance high level communicative competency.

531 Old Spanish (3) Old Spanish language and medieval Spanish literature through 13th century.

532 Medieval Spanish Literature (3) Spanish literature of 14th and 15th centuries.

533 Golden Age Prose (3) Wide range of prose fiction in Spain during 16th and 17th centuries: Moorish, picaresque, sentimental, pastoral and exemplary novels, and dialogues.

534 Don Quixote (3)

535 Golden Age Poetry (3) Garcilaso, Fray Luis de Leon, San Juan de la Cruz, Lope de Vega, Quevedo, and Gongora.


541 Galdós and the 19th-Century Spanish Novel (3) Analysis of works by Galdós and other major 19th-century novelists, Pardo Bazán, Valera, Clarín, and Pereda.


543 The 20th-Century Spanish Novel (3) Baroja, Azorín, Valle-Inclán, Pérez de Ayala, Cela, Delibes, Goytisolo, Malulve, and at least one present-day novelist.

545 Modern Spanish Poetry (3) From Bécquer, Unamuno, A. Machado, Jiménez, Lorca, Guinán, Aleixandre, and a contemporary, Celaya.

547 Modern Spanish Drama (3) Major playwrights of 20th-century Spain.

550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis, Exploration of bibliographical and research materials.

551 Special Topics in Spanish or Spanish American Literature (3) May be repeated. Maximum 6 hrs.

552 Directed Readings (3)

559 Problems in Linguistics: Romance Languages (3) (Same as French 559 and Linguistics 559.)

561 Spanish American Literature to 1880 (3) Selected works of important writers from colonial period and 19th century up to Modernism.


573 The Spanish American Novel: Chile and the River Plate Nations (3) Novels from Chile, Argentina, Uruguay and Paraguay. Modern world.


576 Contemporary Spanish American Poetry (3) Major poets in Spanish American from post-modernismo to present day.

577 Spanish American Drama (3) Major playwrights of 20th-century Spanish America.


579 The Spanish American Short Story (3) Short story by major writers in Spanish America from Romanticism to present day, theory and criticism of genre.

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

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

593 Independent Study (1-15) See page 31. Letter grade or S/NC.

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

621-22 Seminar in Spanish Literature (3,3) Topics vary in field of Peninsular literature. May be repeated with consent of department. Maximum 9 hrs.

631-32 Seminar in Spanish American Literature (3,3) Topics vary. May be repeated with consent of department. Maximum 9 hrs.

Rural Practice

(College of Veterinary Medicine)

MAJOR

DEGREE

Veterinary Medicine ............................................. D.V.M.

D. O. Goble, Interim Head.

Professors:


Associate Professors:


Assistants Professors:


Residents:


Interns:

Moffatt, D. A., D.V.M. ................. Prince Edward Whittaker, T. B., D.V.M. ............... Tuskegee

See Veterinary Medicine for Program Description.

GRADUATE COURSES

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

501 Special Topics in Large Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E

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

600 Doctoral Research and Dissertation (3-15) P/NP only. E
Russian
See Germanic and Slavic Languages

Social Work
(College of Social Work)

MAJOR DEGREES
Social Work ........................................ M.S.S.W., M.S.S.W.-M.Div., M.S.S.W.-M.P.A., Ph.D.

Eunice Shatz, Dean

Professors:
Bloch, M. H. (Emeritus), M.S. ……… Ohio State
Bonovich, Robert C. (Emeritus), D.S.W. ……… Washington (St. Louis)
Fryer, Gideon W. (Emeritus), Ed.D. ……… Columbia
Granger, Ben P., Ph.D. ……… Brandeis
Mullins, M. Kate, Ph.D. ……… Chicago
Kronick, Jane, Ph.D. ……… Yale
Krieger, Ben P., Ph.D. ……… Brandeis
Kronick, Jane, Ph.D. ……… Yale
Bonovich, Robert C. (Emeritus), M.S.W. ……… Ohio State
Bloch, M. H. (Emeritus), M.S.W. ……… Brandeis

Eunice Shatz, Dean

Assistant Professors:
Avery, R. S., Ph.D. ……… Brandeis
Bell, W. J., D.S.W. ……… Tulane
Cetingok, M., Ph.D. ……… Washington (St. Louis)
Charpin, J. W., Ph.D. ……… Peabody
Cruthirds, C. Thomas, D.S.W. ……… Tulane
Faver, C., Ph.D. ……… Michigan
Jennings, J., Ph.D. ……… Michigan
Moses, A. E., D.S.W. ……… California
Spicuzza, Frank, M.S.S.W. ……… Tennessee
Tate, Nellie P., Ph.D. ……… Brandeis
Vaughn, H. H., Ed.D. ……… Memphis State

Associate Professors:

Field Practice Coordinators:
Betz, Phyllis (Knoxville), M.S.S.W. ……… Tennessee
Harris, Joyce (Nashville), M.S.S.W. ……… Tennessee

THE MASTER'S PROGRAM

The Master of Science in Social Work program prepares social workers to provide professional leadership in: 1) the direct provision of social work services and 2) social welfare administration and planning. These objectives are met through a curriculum requiring of all students a professional foundation and a concentration in either social work treatment or social welfare administration and planning.

Admission Requirements

Admission to the Master's program is based on the following requirements:

1. A Bachelor's degree from an accredited college or university with appropriate preparation in the social sciences. At least three-fourths of the applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects. Those with other academic backgrounds should request consultation regarding ways in which they might be admitted.

2. A grade-point average of 2.5 on a 4.0 scale, with preference given to applicants with 3.0 and above. Applicants with less than a 2.5 may be considered for provisional admission on the basis of supplemental evidence of ability to perform at a satisfactory level.

3. Personal qualifications acceptable for entrance into the professional practice of social work.

Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

Advanced Standing

The University of Tennessee College of Social Work has an advanced standing program. Admission to advanced standing requires:

1. A B.S.W. from an accredited program, (2) an overall undergraduate GPA of 3.0 or greater, and (3) successful completion of all areas of an examination covering the five foundation areas.

Students admitted into advanced standing are required to complete a minimum of 39 hours of study in either of the college's concentrations - social work treatment or social welfare administration and planning. These students will follow the curriculum and meet all requirements of the concentration during three semesters of study in the program.

Specific information about the advanced standing program is available from the college.

Application for admission to the advanced standing program is through the regular admission process.

Extended Study

Planned part-time programs are available in all branches of the college. Admission requirements are the same as for full-time study. Coursework can be completed over a three- or four-year period. One year of the student's period of study must be on a full-time basis.

Financial Aid

Students may apply directly to the University's Financial Aid Office for assistance such as the National Direct Student Loan or the Work-Study Program. Other stipends are administered by the College and awarded on the basis of financial need. Applications for these funds must be made to the Branch of the College the student will attend. A student must first apply for University assistance, since College funds are considered supplementary to those of the University. Additional information about College stipends may be obtained from the College of Social Work.

General Requirements

1. A minimum of 54 semester credit hours including a) completion of foundation courses and field practice (15 hours), b) the course Social Work with Oppressed Populations (2 hours), and c) at least five courses (15 hours) and three semesters of field practice (16 hours) in the social work treatment concentration or at least four courses (12 hours) and three semesters of field practice (16 hours) in the social welfare administration and planning concentration.

2. Students may select a thesis or non-thesis option. Those students pursuing the thesis option receive 6 credit hours for successful completion of a thesis.

3. Successful completion of a comprehensive exam or thesis defense.

4. An overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.

The Professional Foundation Curriculum

The foundation curriculum is a 15-semester hour sequence of five basic areas required of all students before entering either of the concentration programs. As the initial phase of student education, the foundation curriculum contributes to the process of professional identification while presenting a comprehensive and broad knowledge base from which to operate in the future as practitioners, supervisors, administrators, and planners.

Upon completion of the foundation curriculum (at the beginning of the second semester), students select a concentration in either social work treatment or social welfare administration and planning.

Social Work Treatment: The social work treatment concentration provides the educational basis for practice with individuals, families, and groups in order to enhance their social functioning, ameliorate problems, and prevent social dysfunction. The concentration provides knowledge of theory and methodology basic to individual, family, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning: The social welfare administration and planning concentration provides the educational basis for leadership in the design, implementation, and evaluation of effective human service programs at local, regional, and state levels.

Field Practice:

Field instruction is a critical component of the student's first- and second-year programs. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee, the college is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agencies and the field instructors to ensure that students have quality field practice experiences, meeting the objectives of the core curriculum and the concentration.

The college uses a concurrent class and field plan. Students are in field two days per week during the first year and three days per week in the second year.

First-year agency placements are selected to provide practice experiences related to the foundation curriculum content and beginning concentration. Within the placement, each student's experiences are planned and designed according to educational objectives.

Second-year placements are selected according to the student's area of concentration.
individual career interests, and educational needs. The student should consult 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 practical skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

Transfer Credits
Coursework equivalent to the first year of the Master's program, completed in another accredited graduate social work program, is usually accepted toward degree requirements. Applicants must meet the admission requirements of The Graduate School and the College of Social Work. Transfer courses must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. An S (earned on an S/NC system) for the field practicum is also accepted. In addition, transfer courses must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This coursework must be completed within the six-year period prior to the receipt of the degree.

A maximum of 6 semester credits from work earned in disciplines other than social work may be transferred as elective credits. The student's academic committee must approve the request and the transfer credit must meet Graduate School requirements.

Proficiency Examination
Students in the Master's program may earn a maximum of nine hours by proficiency examination, with the exception of field practice courses. Students interested in proficiency examinations are referred to The Graduate School statement describing the procedure for applying for examination.

DUAL M.S.S.W./M.P.A. PROGRAM
The Department of Political Science and the College of Social Work offer a dual degree program leading to the conferral of both the Master of Science in Social Work and the Master of Public Administration degrees. In this program, the M.S.S.W. and M.S.S.W. degrees can be earned on a full-time basis in five consecutive terms rather than seven to eight terms.

Admission
Applicants for the M.S.S.W./M.P.A. program must be admitted to the College of Social Work and to the Department of Political Science. In addition, applications from dual degree students must be approved and approved by the dual degree committee that is responsible for overseeing the program. It is anticipated that some students may apply to the dual degree program before they matriculate in either the M.S.S.W. or the M.P.A. program. Students already enrolled in one program will also be permitted to apply, but must do so prior to the end of the first year of study.

Curriculum
Students in the dual degree program are required to take a set of core courses from each curriculum, but the program is designed to be flexible, providing students the opportunity to develop special areas of competence. For the dual degree program, a minimum of 60 hours are required (35 hours must be in social work and 30 hours must be in public administration). Admission to candidacy will be completed separately for each degree.

A comprehensive examination is required in each discipline for students receiving the dual degrees. A faculty committee from Public Administration and one from Social Work will write and grade the respective examination. Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the M.P.A. or the M.S.S.W. degree for courses taken in the other program, except as such courses qualify for credit toward a degree independent of the dual degree program.

Financial Aid
Students may apply or financial aid to both the College of Social Work and the Department of Political Science. Normally, students will not receive funding from both programs concurrently.

DUAL M.S.S.W./M.DIV. PROGRAM
Vanderbilt University Divinity School and the College of Social Work, Nashville Branch, offer a dual degree program leading to both the Master of Science in Social Work and the Master of Divinity degrees. Both degrees can be earned on a full-time basis in eight consecutive semesters rather than ten if completed separately.

Admission
Students interested in the dual degree must apply and be admitted to each university, giving notice on both applications of their interest in the joint program. Students already enrolled in one of the schools may apply to the joint degree program if they are in their first year of study. All dual degree applicants will be reviewed and approved by a dual degree committee that is responsible for overseeing the program.

Curriculum
Students take 72 semester hours at the Divinity School and 48 semester hours at the College of Social Work. In the first two years, students are required to take one full year of coursework (27 to 30 hours) at each school. The first year can be taken at either school. In the third year students are enrolled in both institutions and take twelve hours of coursework at the Divinity School and 18 hours (6 hours of class work and 12 hours of field practicum) at the College of Social Work. In the Spring semester of the third year, students take a comprehensive examination at the College of Social Work. The M.S.S.W. degree is awarded at the end of the third year. Students spend the entire fourth year at the Divinity School completing requirements for the M.Div. degree.

Tuition and Financial Aid
Students pay to each institution the tuition charges and fees appropriate to their registration. Financial aid, if awarded, will be handled separately by each school and will apply only to credit being earned at the school providing the aid.

THE DOCTORAL PROGRAM
The College of Social Work offers the Doctor of Philosophy with a major in Social Work. The focus of social work education at the doctoral level is to foster the development of an attitude of scientific inquiry, knowledge of the scientific method, ability to extend the knowledge base of social work practice, and effective participation in leadership roles in social work education, research, and practice.

The emphasis of the doctoral program is upon:
- The analysis of direct intervention and social administration and of the 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 Nashville. Students and their committees can develop a plan for completing their research in Nashville and Memphis based on the availability of dissertation resources.

Admission Requirements
The Ph.D. program is designed for students who have completed a Master's degree in an accredited school of social work and have post-Master's social work practice experience. Applicants who do not meet these requirements, but believe they have equivalent credentials, should contact the Chair of Ph.D. program for further information regarding admissions criteria.

General Requirements
1. A minimum of 60 semester hours beyond the Master's degree including a) completion of 21 credits of required coursework, b) completion of 15 credits of advanced elective, 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 credits of dissertation research.
2. Successful completion of qualifying and comprehensive examinations.
3. Completion and defense of the dissertation.

Curriculum
The curriculum of the Ph.D. program consists of foundation course work, electives, and dissertation research. The foundation curriculum consists of 21 hours of coursework in the history and philosophy of social work, issues in direct service and administration and planning, areas of practice, and research methodology and statistics. Upon this foundation, students and their committees develop a plan of study consisting of coursework in Social Work and other departments of the University.

Typically, the foundation curriculum is completed and elective coursework begun during the first year of study, the elective requirement is completed and dissertation research begun in the second year of study, and dissertation research is continued in the third year of study. While it is generally expected that the coursework will be completed on a full-time basis, dissertation research can be completed on a planned part-time basis.
Specific courses required are 601, 602, 612, 613, 640, 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 material in three core courses and is administered by the doctoral committee. The comprehensive examination is administered by members of the doctoral committee and is designed for the student to demonstrate comprehensive knowledge of the major and cognate areas and the dissertation topic. In case of failure of either examination, the student may request a retake. The result of the second examination is final.

Financial Aid
Financial aid is available to qualified students in the form of fellowships, scholarships, and teaching and research assistantships. Graduate assistantships and other forms of assistance are awarded on the basis of merit and interest to applicants who are accepted into the Ph.D. program.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville in an in-state tuition basis. The M.S.S.W. and Ph.D. programs in Social Work are available to residents of the state of Arkansas; the Ph.D. to residents of Kentucky or West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES
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) F/P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 6 hrs. S/NC only. E
508 Practicum in Social Work Research (3-6) Supervised practice in application of research methods to social work. Prereq.: 510 and consent of faculty conducting investigation. May be repeated. Maximum 6 hrs. S/NC only. E
509 Graduate Seminar in Public Health (1) (Same as Public Health 529, Nutrition 509, Physical Education 509 and Nursing 509). F
510 Social Work Research (3) Research methodology applied to problems in social welfare. Problem formulation, research design, ethics, instrument construction, data collection, analysis, and reporting; statistical procedures; research reporting; and evaluation and utilization of research. Prereq.: Admission to college or consent of instructor. F
512 Social Work Practice (3) Basic theory, values, and methodology generic to social work practice at various sociocultural levels presented from ecological perspective. Assessment, planning, communication, and evaluation skills. Classroom and skills laboratory experiences. Prereq.: Admission to college or consent of instructor. F
514 Human Behavior and Social Environment (3) Theories pertaining to individual, family, small group, and community in context of functions, structure, roles, and processes. Systems conceptualized along functional- dysfunctional and normal-deviant continuum: stress, development and maturation. Open systems approach to understanding biological, psychological, sociological, and social variables, implications of culture, race, ethnicity, and gender. Prereq.: Admission to college or consent of instructor.
516 Social Welfare Policy and Services (3) Development and implementation of public social policy and social programs to meet community needs. Social programs developed through public participation and by providing social services to individuals and families. Prereq.: Admission to college or consent of instructor. F
516 Seminar in Social Welfare Administration and Planning (3-2) Issues and areas relating to methods and techniques of social welfare administration and planning. Prereq.: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.
517 Seminar in Social Welfare (2-3) Social welfare problem area of interest to student. Prereq.: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.
522 Social Work Treatment with Groups (3) Theories and practice of social work with small groups. Treatment groups, task groups. Prereq.: Foundation or consent of instructor. F
523 Social Planning (3) Theory, philosophy, implications for programs for planning social change in diverse fields of service. Prereq.: Foundation or consent of instructor.
524 Psychopathology and Social Deviance (3) Theories of and recent research in etiology of psychic dysfunction and social variance. Categorical approach to psychopathology. Prereq.: Foundation or consent of instructor. F
526 Research for Assessment of Social Work Treatment (3) Application of research methods for assessment of social work treatment. Prereq.: Foundation, 520 or 522, or consent of instructor. Sp
529 Seminar in Social Work Research (3) Development of knowledge and research in social work. Prereq.: Foundation or consent of instructor. S
530 Social Work Treatment with Couples (3) Theories and practice in social work with couples. Prereq.: Foundation or consent of instructor. F
530 Seminar in Social Work Treatment (2-3) Topics in theory and practice of social work treatment with individuals, couples, families, and groups. Prereq.: Foundation and 520, or consent of instructor. Required for group treatment: 522. May be repeated. Maximum 6 hrs.
531 Family Therapy in Social Work Practice (3) Major family therapy models, perspectives on family dynamics and interaction, and techniques of treatment and their application to families from diverse social and cultural backgrounds. Prereq.: Foundation and 520, or consent of instructor.
532 Short-Term Treatment (3) Theory and practice of planned short term treatment, emergency treatment, and crisis intervention. Prereq.: Foundation and 520, or consent of instructor. Sp
533 Social Work Treatment with Children and Adolescents (3) Examination of various treatment modalities for assessing and treating children and adolescents. Prereq.: Foundation and 520, or consent of instructor. F
534 Social Work Practice with Children and Adolescents (3) Examination of various treatment modalities for assessing and treating children and adolescents. Prereq.: Foundation and 520, or consent of instructor. F
540 Administration of Social Welfare Programs and Services (3) Analysis of organizations and provision of services to clients. Models of social welfare administration, their historical and philosophical perspectives, context for designing organizational structure and processes, planning, implementation, and mergers; agency policies and programs, and management of service delivery system. Prereq.: Foundation or consent of instructor. Sp
542 Financial Management and Resource Development in Social Welfare Administration (3) Administrative decision-making related to financial planning and resource development. Knowledge and skills in accounting, budgeting and auditing; techniques in fundraising, grant writing, marketing and other financial management and resource development techniques. Prereq.: Foundation or consent of instructor.
544 Management Information Systems and Evaluative Research (3) Management information systems design, implementation, evaluation, and interpersonal and organizational decision-making and policy setting. Prereq.: Foundation or consent of instructor.
546 Human Resources Development in Social Welfare Administration (3) Administrative and leadership skills required for management and development of human resources. Prereq.: Foundation or consent of instructor. Prereq.: Foundation or consent of instructor. Sp
565 Field Practice (6) Instruction and supervision in social work practice to prepare students for field experience to enter final year of graduate study upon successful completion of term. S/NC only. Summer
580 Field Practice (3) Instruction and supervision in social work practice. Prereq.: or coreq.: 512. S/NC only. E
581 Field Practice (4) Instruction and supervision in social work practice. Prereq.: or coreq.: 512. S/NC only. F
582 Field Practice (8) Instruction and supervision in social work practice. Prereq.: or coreq.: 581. S/NC only. Prereq.: Foundation or consent of instructor. F
583 Field Practice (6) Instruction and supervision in social work practice in social welfare administration (3)
Sociology

(College of Liberal Arts)

MAJOR DEGREES

Sociology ........................................ M.A., Ph.D.

Thomas C. Hood, Head

Professors:

Betz, D., Michael, Ph.D. ......... Michigan State
Black, John A., Ph.D. ............. Iowa
Clelland, Donald C., Ph.D. ...... Michigan State
Hastings, Donald W., Ph.D. .... Massachusetts
Hood, Thomas C., Ph.D. .......... Duke
Ploch, Donald R., Ph.D. ........... North Carolina
Shover, Neal, Ph.D. ............... Illinois
Wallace, Samuel E., Ph.D. ......... Minnesota

Associate Professors:

Benson, Michael L., Ph.D. ......... Illinois
Kurth, Suzanne B., Ph.D. ......... Illinois (Chicago)
Perrin, Robert G., Ph.D. .......... British Columbia

Assistant Professors:

Cable, Sherry, Ph.D. ............... Penn State
Gaventa, John P., Ph.D. .......... Oxford

The Sociology Department offers graduate study leading to the Master of Arts and the Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option. The graduate program has concentrations in criminology, energy, environment, and resource policy; and political economy. The criminology concentration includes 505, 551, 653, and 655. The energy, environment and resource policy concentration includes 560, 563, 681, 682, 683, and 665. The political economy concentration includes 504, 540, 541, 643, 644, and 645. Both the Master's and the doctoral program allow for the construction of individualized programs of study. Detailed information may be obtained from the Director of Graduate Studies in Sociology. All incoming students will be advised by the Director of Graduate Studies.

ADMISSION REQUIREMENTS

1. Acceptable scores on the general Graduate Record Examination (GRE scores in sociology are requested but not required).
2. Three letters of recommendation (forms may be obtained from the department).
3. Completion of the appropriate previous degree (baccalaureate, preferably with a major in one of the social sciences or the M.A. program; Master's degree in one of the social sciences for the doctoral program).

THE MASTER'S PROGRAM

Thesis Option

A minimum of 30 hours beyond the baccalaureate degree, including 24 hours of coursework and 6 hours of Thesis 500, is required. Students must complete Sociology 521, 531, 535, and one 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, 535, and one of the following: 504, 505, or 560. Sociology 534, 536, and 622 are recommended. Sociology courses at the 400 level may be taken with the approval of the student's committee. A student's plan of study should follow one of the following approaches: Plan 1, 6 hours in one of the department's concentrations and 6 hours in a second area, including areas outside the department, subject to the approval of the student's committee. Plan 2, 12 hours in a special area of study approved by the student's committee and the department's Graduate Program Committee. Students are encouraged to prepare a paper synthesizing the field experience (thesis) or concentration(s). Students who incorporate supervised field experience in their programs are encouraged to prepare a report based on theses experiences that demonstrates the understanding of research, theory, and report writing. All students must take final written and oral examinations that include questions on their general coursework in theory and methods and on special areas of study.

Subject to approval by the student's committee, up to 12 hours may be taken in courses outside the department for either program.

THE DOCTORAL PROGRAM

Coursework

The 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, 535) 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 536 or another advanced course in statistics. Completion of 9 hours in each of two concentrations is encouraged. A student who cannot achieve his/her educational goals within the department's concentrations may construct an individualized course of study subject to the approval of the student's doctoral committee and the Graduate Program Committee. Sociology courses at the 400 level may not be taken without the consent of the student's advisor and the Graduate Program Committee. Course hours may be taken in related fields without petitioning the Graduate Program Committee for approval. The student's program may include a minor or cognate field.

Comprehensive Examinations

Written examinations in four areas are required (theory, research methodology, and two substantive areas). Doctoral students are eligible to take the theory and methodology examinations whenever offered. Substantive examinations may be taken upon completion of theory and methodology examinations. Detailed information on examinations and examination options (generalist, specialist, and collateralist) may be obtained from the department.

Dissertation and Final Examination

A dissertation based on original research must be completed (24 hours). The candidate must pass an oral defense of the dissertation, including the theory and methodology related to the research, in accordance with the deadlines specified by The Graduate School.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

405 Sociology of Sport (3) Social meaning, organization, and process of sport. Prereq: 291 or consent of instructor. Same as Physical Education 405.

413 Formal Organization (3) Analysis of organizational models, typologies, and theories; hierarchies of authority; communication; interpersonal relations in work settings; organizational change.

414 Sociology of Health Care (3) Organization of health care facilities, staff-patient relationships, demographic characteristics, and prevalence of disease.

415 Sociology of Aging (3) How roles and statuses change with age in relation to major social institutions;
impact that rapidly increasing number of older people has on social policies and the economy.

446 The Modern World System (3) Critical examination of capitalist world-system as social system, its coherence, boundaries, regions, member groups, cleavages, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.


455 Society and Law (3) How laws and legal processes are affected by social change, social impact of legal sanctions, relations between law and social justice.

459 Organizational and Corporate Crime (3) Analysis of crime and deviance committed by organizations. Case studies of corporate and organizational crime, organizational dynamics of crime, theories of corporate crime, and organized responses to this type of crime by governmental regulatory agencies.

462 Populations (3) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

464 Urban Ecology (3) Relation of humans to their urban environment: conservation and use of appropriate technologies. (Same as Urban Studies 464.)

471 Sociolinguistics (3) (Same as English 471 and Linguistics 471.)

480 Diffusion of Agricultural Technology (3) (Same as Rural Sociology 480.)

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

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

504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict.

505 Foundations of Criminology (3) Critical overview of contemporary developments in criminology, theories of crime causation and theories of responses to crime. Prereq: 350 or equivalent.

507 Foundations of Social Psychology (3) Current and classical theoretical perspectives in social psychology.

510 Teaching Sociology (3) Art and craft of teaching sociology from curricular considerations through teaching techniques. May be repeated. Maximum 6 hrs.

521 Sociological Theory I (3) Assessment of what sociological theory is; its major figures and their approaches to understanding society.

531 Research Methods in Sociology (3) Research design, measurement, sampling, qualitative and quantitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Underlying assumptions and logical procedures used by sociologists in formulating explanations. Foundations of sociological research strategies and techniques.

535-536 Statistical Analysis in Sociology I, II (3,3) Should be taken in sequence. 535 - Symbolic logic, set theory, linear regression of social variables. 536 - Non-parametric analysis, log-linear analysis, advanced regression. Prereq: Introduction to Statistics or consent of instructor.

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 change, processes of human cooperation and efforts of collectives to change existing society.

542 Sociological Aspects of Sports and Physical Education (3) (Same as Physical Education 542.)

543 Sociology of Development (3) Sociological theories and studies of development: modernization, colonization, dependency; comparative impact of various developmental paths upon selected aspects of social structure and change.

551 Delinquency and the Social Structure (3) How study of delinquency and juvenile justice is affected by changing structures of childhood and adolescence, changing demographic and institutional influences, and changing views about responsibility and punishment.

560 Environmental Sociology (3) Systematic treatment of current research in environmental sociology, Social impact analysis and conflicts over environmental issues.

563 Demographic Techniques (3) Standard rates and measures of demographic variables, life table analysis, increment-decrement models, and survey techniques of population and organizational structure; job satisfaction, motivation, morale and interpersonal phenomena.

580 Advanced Rural Sociology (3) (Same as Rural Sociology 580.)

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

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

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

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

594 Social Theories of Sport (3) (Same as Physical Education 515.)

595 Special Topics in Rural Sociology (1-3) (Same as Rural Sociology 593.)

599 Readings (3) Selected topics. May be repeated. Maximum 6 hrs.

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

611 Complex Organization (3) Selected topics in formal organizations; cases and incident process analysis; examines strategies for dealing with organizational change, authority hierarchies, communication patterns, technological and organizational structure, job satisfaction, motivation, morale and interpersonal phenomena.

622 Sociological Theory II (3) Distinct schools of sociological theory and contributions of their principal exponents.

629 Supplementary Readings in Sociological Theory (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of instructor. S/NC only.

633 Survey Design and Analysis (3) Systematic exploration of survey problems through student participation in design and analysis of survey. Prereq: 531 or consent of instructor. (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/NC only.

643 Class Analysis (3) Critical analysis of theories and research on race and gender.

644 Political Sociology (3) Critical examination of theories of state and political processes.

645 Advanced Studies in Political Economy (3) Topical seminar. Prereq: 504 or consent of instructor. May be repeated. Maximum 6 hrs.

653 Sociology of Law (3) Intensive examination of selected topics in sociology of law. Prereq: 505 or consent of instructor.

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.

662 Urban and Regional Sociology (3) Historical and contemporary studies of South and Appalachian region with comparisons to other regions.

663 Advanced Studies in Population (3) Current theoretical issues and methodological advances in fertility, mortality, and migration in modern or historical demography. Prereq: 563 or consent of instructor. May be repeated. Maximum 6 hrs.

665 Advanced Studies in Energy, Environment and Natural Resources Policy (3) Topical seminar covering particular line of research and theory with in 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 Romance Languages

Special Programs

Special Programs (College of Liberal Arts)

James R. Stokely Institute

Lynn Champion, Director

Enrollment in the following courses is restricted to participants in the James R. Stokely Institute Follows Program in the College of Liberal Arts and requires the Program Director's approval. Tennessee elementary and secondary school teachers who are certified and have a minimum of five years teaching experience may apply to participate in the Institute. Selection of participants is based on academic ability, references, an application essay and an interview of final candidates.

GRADUATE COURSES

The Stokely Institute curriculum is comprised of three seminars which are offered once annually during summer term. The seminars are interdisciplinary in focus and are team-taught by faculty representing the humanities and fine arts, the natural sciences, and the social sciences. The content of the three seminars embraces the three major areas of inquiry in the liberal arts, with an emphasis on understanding the characteristic methods and goals of each mode of inquiry and the kind of knowledge each mode yields. Seminar participants are encouraged to think critically and to reflect on the intellectual and practical implications of their learning.

510 Humanities Perspectives in the Liberal Arts (2) Seminar on nature of inquiry in humanities. Emphasis on nature and special forms of human experience and its interpretation through study of formative tests and critical figures.

520 Natural Science Perspectives in the Liberal Arts (2) Seminar on nature of inquiry in physical and biological sciences drawing on history of science, critical figures in
THE MASTER'S PROGRAMS

Special Education

The department offers two tracks for the Master's degree in Special Education for all areas of concentration. Track 1 is for students who are already licensed to teach in special education or a related field or those who are seeking a Master's degree without teacher licensure. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

An area of concentration may be selected from the following: early childhood special education, general special education, or education of the hearing impaired.

- Track 1 students select coursework based on their area of concentration as described below. Some coursework may apply toward State of Tennessee endorsements (add-on certifications). The non-thesis option requires 36 hours, including a minimum of 18 in special education, and a final written and oral comprehensive examination. The thesis option requires 30 hours including 6 hours of Thesis 500.

- Track 2 students select coursework based on a specified course of study required for teacher licensure and options for areas of specialization and/or cognates as described below. The non-thesis option requires 24 hours of internship year coursework and an additional 12 hours prescribed by the student's committee, for a total of 36 hours. The thesis option requires 6 additional hours of Thesis 500 for a total of 42 hours.

Students completing a program of study in the early childhood special education concentration area are qualified to be preschool teachers, home-based interventionists, educational consultants, and family service coordinators. The curriculum is interdepartmental in nature, with most of the coursework offered by the Departments of Special Services Education and the Department of Child and Family Studies. Additional department offerings may be included through elective hours.

Students completing a program of study in the general special education concentration area are qualified to be teachers and/or consultants in a variety of special education programs providing services to people certified as mentally retarded, learning disabled, emotionally disturbed, gifted, physically disabled, multiply disabled, and socially or emotionally disturbed. General special education majors, in conjunction with their committees, select one or more specializations for their program of study. Six to nine hours of coursework in the designated areas should be taken. Approved specializations include affective/motivational approaches, assessment/diagnosis, cognitive education, early childhood, gifted education, rehabilitation, and/or technology. Students also may select a cognate of three to six hours of coursework taken outside the department.

Students completing a program of study in the education of the hearing impaired concentration area are qualified to teach in public or residential schools for the hearing impaired. Graduates are eligible for both Council on Education of the Deaf (CED) certification and Tennessee state certification. Internships (student teaching) may be completed at the Tennessee School for the Deaf, in mainstream programs in the state or in programs for the hearing impaired in North Carolina, Kentucky, Georgia, Virginia, and the District of Columbia.

Rehabilitation Counseling

The Rehabilitation Counseling program enables counselors to acquire competencies which facilitate the movement of a person with disabilities toward optimal functioning in the three broad areas of living, learning, and working. The rehabilitation counselor works primarily with adults who are being served in various public and private settings. Students should expect to spend four semesters, including summer, in coursework and in internship. The program requires 54 semester hours. Both a thesis and non-thesis option are available.

ADDITIONAL PROGRAMS

Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), specialized institutes for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people are provided. A federal supported Educational Consortium provides staff development and technical assistance for post-secondary programs serving hearing impaired students in a 13-state southeastern region.

Details concerning each program can be obtained by writing to the department head.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Special Education is available to residents of the states of Kentucky or West Virginia; the M.S. in Rehabilitation Counseling is available to residents of Louisiana. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Special Education

GRADUATE COURSES

410 Pre-Internship Seminar (1) Orientation, objectives and policies of internship program. Must be completed term immediately preceding internship. Prereq: Admission to teacher education program. S/NC only. Sp,Su

421 Field Experience in Modified Programs (3) Practices in teaching in modified programs: planning, developing, implementing and evaluating instruction. Prereq: Special Education Principles and Special Education Strategies, Admission to Teacher Education and Curriculum and Instruction 422. Coreq: 420. SNC only.

423 Communication Processes for the Hearing Impaired (3) Expressive and receptive vocabulary development in sign communication. Fingerspelling and educational applications of sign language.

424 Nature of Hearing Impairments (3) Basic principles of audiology: anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interpretation of audiometric services to medical and other rehabilitative disciplines.

425 Introduction to the Psychology and Education of the Hearing Impaired (3) Primarily for those planning to teach hearing impaired. Overview of research related to psychology, social adjustment, communication methodology, language development and education of hearing impaired. Survey of literature. Visits to programs.
561 Psychology of Mental Retardation (3) Psychological, social, legal, and ethical issues related to mental retardation.

562 Instructional Systems for the Mentally Retarded (3) Specific developmental, behavioral strategies, and techniques. Curricular design techniques and evaluation. Educational needs of mentally retarded children and youth. Prereq or coreq: 561 or consent of instructor.

563 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 consent of instructor.

565 Instructional Systems for the Gifted and Talented (3) Instructional methods and systems evaluated in terms of effectiveness in various educational environments. Prereq or coreq: 564 or consent of instructor.

568 Early Intervention for Handicapped Children (3) Exploration of characteristics and needs of young handicapped children. Program and curriculum development of early intervention system.

575 Creative Problem-Solving Strategies for Special Educators (3) Techniques for solving problems encountered by special educators in any setting.

579 Special Topics (1-3) Prereq: Admission to graduate program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

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


590 Application of Microcomputer Technology in Special Education and Vocational Rehabilitation (3) Application of microcomputer technology with all categories of exceptionalities and across all chronological and functioning age ranges. Microcomputer adaptive software, special switch access, authoring systems, telecommunication, and strategies for cognitive development.

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

592 Assistive Technology in Special Education and Vocational Rehabilitation (3) Technology as applied to needs of school age and post-secondary age students. Delivery of assistive technology services: software programs and assistive devices; delivery systems, interdisciplinary evaluation/planning, and funding issues.


595 Clinical Experience in Assessment and Instruction (3) Academic remediation applied in lab/school setting; tasks related to teaching: assessment, preparation of lessons, and delivery of instruction. Coreq: 553. S/NC or letter grade.

596 Doctoral Research and Dissertation (3-15) P/NP only. May be repeated. Maximum 36 hrs. S/NC or letter grade.

601 Seminar in Educational Theories in Special Education and Rehabilitation (3) Education theories: education and rehabilitation of exceptional persons. Theoretical applications in educational settings. Prereq: Admission to doctoral program or consent of instructor.

602 Seminar in Social Processes in Special Education and Rehabilitation (3) Social phenomena which influence impact of disability on person and on significant others. Implications for habilitation. Prereq: Admission to doctoral program or consent of instructor.

603 Seminar in Research 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 (3-6) Placement with professional engaged in the theoretical research. Public school institutions, agencies or university settings. Prereq: 9 hrs in statistical and research methods. May be repeated. Maximum 15 hrs. S/NC only.

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under supervision of practitioners. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

679 Special Topics (1-3) Prereq: Admission to doctoral program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

**Speech Communication**

(Graduate of Liberal Arts)

Faye D. Julian, Acting Head

Professors:

Julian, Faye D., Ph.D. Tennessee
Lester, Lorayne W., Ed.D. Tennessee
Yeomans, G. Allan (Emeritus), Ph.D. Louisiana State

Associate Professors:

Ambrester, M. L., Ph.D. Ohio State
Buckley, J. E., Ph.D. Northwestern
Cook, N. C., M.A. Alabama
Glen, Robert W., Ph.D. Northwestern

Assistant Professor:

Ambler, R. S., Ph.D. Ohio State
Haas, John W., Ph.D. Kentucky

Graduate courses in Speech Communication provide opportunities for students in a variety of disciplines to investigate how oral language can effect changes in the knowledge, the understanding, the ideas, the attitudes, or the behavior of other human beings.

**GRADUATE COURSES**

420 Communication and Conflict (3) Communication as significant factor in development, management, and resolution of conflict at interpersonal, small group, organizational, and societal levels.

440 Organizational Communication (3) Organizational setting and variables of communication process that affect quality of human interaction both within and outside organizations.

460 History of Rhetorical Theory (3) Western rhetorical theory from Plato to present.

465 Studies in Rhetorical History and Criticism (3) May be repeated. Maximum 6 hrs.

466 Rhetoric of the Women's Rights Movement (3) Historical and critical study of public address in campaign for women's rights from 1830's to present. (Same as Women's Studies 466.)

470 Theories of Argumentation (3) Studies of conceptual bases of argumentation from classical to contemporary theorists. Prereq: Consent of instructor.

490 Ensemble Interpretation (3) Study and presentation of literary texts through group performance.

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

502 Registration for Use of Facilities (3-15) 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 Fundamentals of Graduate Research in Speech Communication (3) Techniques of historical, descriptive, and experimental research.

510 Studies in Persuasion (3) Prereq: 310 or equivalent or consent of instructor.

530 Topics in Group and Interpersonal Communication (3) Prereq: 320, 330, 420, or consent of instructor. May be repeated. Maximum 6 hrs.

550 Communication Theory (3) Analysis of contemporary theories of human communication, similarities and differences of communication processes in intrapersonal, interpersonal, small group, organizational, and public communication. Prereq: 350 or equivalent or consent of instructor.

560 Studies in Rhetoric (3) Content varies. Prereq: 460 or consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

570 Law and Ethical Issues of Communication (3) Communication rights and responsibilities. Prereq: Consent of instructor.

575 Directing the Forensics Program (3) Philosophy and methods of directing cocurricular and extracurricular forensics activities in high schools and colleges; competitive and noncompetitive approaches to directing debate, oral interpretation and public speaking events.

589 Theory and Production Techniques of Oral Interpretation (3) Literary, psychological, communicative, and aesthetic approaches to collection, adaptation, and oral presentation of literature. Prereq: 380, 385, 480, or consent of instructor.

590 Directed Reading and Research (3) May be repeated. Maximum 6 hrs.

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

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

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

**Statistics**

(Graduate of College of Business Administration and Intercollegiate Program)

MAJORS

DEGREES

Statistics

M.S. Business Administration

MBA

David L. Sylwester, Head

Professors:

Downing, Darryl J. (Adjunct), Ph.D. Florida
McLean, Robert A., Ph.D. Purdue
Parr, William C., Ph.D. Southern Methodist
Philpot, John W., Ph.D. VPI
Sanders, William L. (Adjunct), Ph.D.
Sylwester, David L., Ph.D. Stanford
Thigpen, Charles C., Ph.D. VPI

Associate Professors:

Guess, Frank M., Ph.D. Florida State
Leinaker, Mary C., Ph.D.
Leon, Ramon V., Ph.D. Florida State
Mee, Robert W., Ph.D. Iowa State
McGuire, Stephen S. (Adjunct), Ph.D.
Raney, Gipsie B. (Adjunct), Ph.D. ... NC State
Wright, Tommy D., Ph.D. Texas State University
Sanders, Richard D., Ph.D. Ohio State University
Younger, M. S., Ph.D. VPI

Assistant Professors:
Lin, Dennis K. J., Ph.D. Wisconsin University
Walker, Estaban, Ph.D. VPI

Lecturer:
Schmidhammer, James L., Ph.D. Pittsburgh University

Instructors:
Cwiek, Charles, M.S. Tennessee State University
Neidert, Sharon, M.S. Miami (Ohio)
Wright, S. Paul, M.S. Tennessee State University

Additional Intercollegiate Program Members:

Bunting, Dewey, Liberal Arts
Dessart, Don, Education
Fribourg, Henry, Plant and Soil Science
Glisson, Charles, Social Work
Huck, Schuyler W., Educational Counseling Psychology
Ladd, R. T., Management
McLaren, J. B., Animal Science
Miller, Mark, Communications

THE MASTER’S PROGRAM

The M.S. program in Statistics provides students with the foundations in theory and practice required for careers in applied statistics. In addition to the education traditionally offered in such a program, the department offers a concentration in industrial statistics, which provides unique opportunities for experiences in practical applications of statistics. Through involvement in The University of Tennessee Institute for Productivity Through Quality and related programs, department faculty participate in a variety of consulting and research projects in industry. Students may supplement their classroom study with an industrial internship and participation in research projects dealing with industrial problems. Department faculty also collaborate with researchers from many academic disciplines and hold joint appointments with the College of Agriculture, the Computing Center and the Medical Center. Statistics graduate students may gain consulting experience by working with faculty involved in these consulting activities. All students are required to participate in supervised internship or consulting activities as part of their graduate program.

Individuals with undergraduate or graduate degrees in other disciplines are encouraged to enter the program. The candidate’s mathematics background should include differential and integral calculus of several variables. Individuals with limited mathematics background should seek departmental guidance regarding specific ways in which they may prepare themselves for the program by taking coursework as non-degree students. Requests for application forms and further information may be sent to the Director of Graduate Studies, Department of Statistics, Stokely Management Center, University of Tennessee, Knoxville, TN 37996-0532.

Admission Requirements
General admission requirements for The Graduate School are stated beginning on page 13. Applicants for Statistics must submit results of the Graduate Record Examination (GRE) general portion, although GMAT exam scores may be substituted. Applicants for the statistics program must have completed at least two years of college-level mathematics, including the calculus of several variables and matrix algebra, and be proficient in a computer language. Applicants whose native language is other than English must submit results of the Test of English as a Foreign Language (TOEFL).

Curriculum
A minimum of 33 credit hours must be completed for the Master’s degree. Required of all students are 6 hours in statistical methods, 6 hours in statistical theory, 1 hour in statistical computing, and 3 hours in either supervised consulting or internship. Students must complete a minimum of 21 hours in approved statistics courses, exclusive of consulting, internship, independent study, or thesis.

Thesis or Independent Study
The thesis option for the Master’s degree requires the student to complete 6 hours for the thesis. Alternatively, the non-thesis option requires a minimum of 2 hours for an independent study project.

Comprehensive Examination
Students must pass a two-part written comprehensive examination covering 1) theory and 2) methods. Upon failing either part of the examination, the student may retake it. The result of the second examination is final. For students writing a thesis, this examination must be passed before the thesis is defended.

INTERCOLLEGIATE GRADUATE STATISTICS PROGRAM

The Intercollegiate Graduate Statistics Program is a formal University of Tennessee academic program established to recognize graduate students for completing the requirements of a major or minor in Statistics as part of their degrees. The program enables a student to obtain the M.S. in Statistics simultaneously with the Ph.D. or Ed.D. in another department. The program also enables a student to obtain a joint major in Statistics and a minor in another department. The program is open to well-qualified graduate students writing a thesis, independent study, or thesis. 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.

Degree Requirements
The program offers the M.S. in Statistics with a minor in another department, a joint major program in which the student earns a Master’s or doctoral degree in the student’s sponsoring department along with the M.S. in Statistics, and a joint major and minor program in which the student earns a Master’s or doctoral degree in the student’s sponsoring department along with a minor in Statistics. The table below presents the minimum number of semester hours in statistics for each of these alternatives. The hours do not represent the minimum required for the degree program. The student must earn a minimum of 33 credit hours in approved courses to satisfy the requirements established by the student’s sponsoring department and approved by the Program Executive Committee. The student’s committee must include a faculty member of the Statistics Department at the rank of Assistant Professor or above. The student’s formal examination procedure as established by the sponsoring department must include an appropriate section on statistics.

Successful completion of the Statistics minor/major is recognized by appropriate documentation on the student’s transcript. Students who do not complete all requirements for the Statistics minor/major will still receive academic credit for statistics courses they have successfully completed.

Degree Program:

<table>
<thead>
<tr>
<th>Program</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S. in Statistics, minor outside of Statistics</td>
<td>21</td>
</tr>
<tr>
<td>M.S. outside of Statistics, minor in Statistics</td>
<td>8</td>
</tr>
<tr>
<td>M.S. outside of Statistics, both degrees</td>
<td>24</td>
</tr>
<tr>
<td>Doctorate outside of Statistics,** minor in Statistics</td>
<td>16</td>
</tr>
<tr>
<td>Doctorate outside of Statistics,** in Statistics</td>
<td>24</td>
</tr>
</tbody>
</table>

**Approved Statistics courses from the Department of Statistics and/or other departments.

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

Minimum course requirements are 571, 566, 572 with prereq or coreq of 561.
ACADEMIC STANDARDS

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

GRADUATE COURSES

411 Introduction to Statistical Computing (3) Use of computer operating system commands and packaged programs for statistical analysis and file management. Not available for credit for statistics majors. Prereq: 201 or 251.


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

501 Statistics for Management (3) Fundamentals of descriptive and inferential statistics. Introduction to probability models, statistical inference: statistical process control, correlations and regression, basic time series. Open only to MBA students.

502 Registration for Use of Facilities (3-15) Required for student not otherwise registered during any semester when student uses University facilities and/or faculty personnel. Involves formalized, automated means of advising toward degree requirements. May be repeated. Maximum 6 hrs. S/N or letter grade.

531 Statistical Methods for the Social Sciences I (3) Probability distributions, sampling distributions, parametric and nonparametric estimation and hypothesis testing, simple linear regression and correlation. Credit not given for both 531 and 537. Prereq: 1 yr college mathematics and 1 course in statistics.

532 Statistical Methods for the Social Sciences II (3) Multiple regression and correlation, use of dummy variables, general linear model, analysis of variance and covariance. Prereq: 531.


538 Statistics for Research in the Behavioral and Biological Sciences II (3) General linear model as applied to multiple regression and analysis of variance. Diagnostic and influence techniques. One-way, factorial, blocked, and nested designs, preplanned versus post hoc contrasts. Random factors and repeated measures. Prereq: 537.

561 Introduction to Computing for Data Management and Analysis Using a System Environment for Business Applications. Use of operating system commands, system editor, utility programs and major statistical packages. SAS for data entry and editing, file management, and statistical analysis in interactive and batch environments. IBM, CMS, and MVS. Use of microcomputers for data analysis. Coreq: 531, 537, or 571; or consent of instructor.


564 Theory of Statistical Inference (3) Introduction to theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 563.

566 Statistical Techniques in Industrial Processes (3) Applications of control charts and other statistical techniques in industrial setting. Attributes and variables control charts, process capability analysis, aspects of sampling, statistical tolerancing, estimation of variance components, problems of measurement, special industrial applications. Prereq: 571 or equivalent.


572 Applied Linear Models (3) Simple and multiple linear regression using matrix algebra and general linear model; polynomial regression; weighted least squares regression, variable selection techniques, multicollinearity, regression diagnostics; general linear model approach to analysis of data from designed experiments. Use of standard computer packages. Prereq: 571 and matrix algebra.

573 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations; factorial experiments, completely randomized, randomized block, split-plot and nested designs, fractional factorials, sequential designs. Prereq: 571.

585 Principles of Statistical Process Management (3) Control charts and other statistical techniques applied to management of business processes. Prereq: Consent of department head.

587 Graduate Seminar (1) Directed readings and active participation in colloquium program of Department of Statistics and of student's minor program. Prereq: Consent of statistics department director of graduate studies. May be repeated. Maximum 2 hrs. S/N C only.


593 Independent Study (2-6) Faculty directed readings and investigation of specialized 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/N C only.

681 Special Topics in Probability (1-3) Presentation of specialized topics in probability and stochastic processes. May be repeated. Maximum 6 hrs.

683 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

691 Reading (1-6) Reading and investigation of specified topics in probability or statistics. May be repeated. Maximum 6 hrs.


693 Independent Study (2-6) Faculty directed readings and investigation of specialized 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/N C only.

695 Statistical Consulting Practicum (1-6) Supervised experience helping off-campus researchers plan, manage data, and develop and perform analyses specific to designs, data, and hypotheses. Discussion of activities in regular seminar meetings. Final written reports and/or detailed diaries. Prereq: 572 or 536. May be repeated. Maximum 6 hrs.


698 Applications of Control Charts and Other Statistical Techniques (3) Applications of control charts and other statistical techniques. Theory, applications, and use of statistical software. Prereq: 1 yr graduate-level statistics, regression analysis and analysis of variance and familiarity with CMS or VAX; or consent of instructor.

699 Thesis or Dissertation (1-15) For the Master's degree. May be repeated. Maximum 15 hrs.


899 Reading (1-6) Reading and investigation of specified topics in educational research. May be repeated. Maximum 6 hrs.

899E Reading (1-6) Reading and investigation of specified topics in educational research. May be repeated. Maximum 6 hrs.

999 Research Experience (1-6) Undergraduate research experience in a specified topic in educational research. May be repeated. Maximum 6 hrs.

ACADEMIC POLICIES

General policies and procedures for graduate study are set forth in the Graduate School bulletin. Students are expected to be familiar with these policies and procedures. The college may require additional policies and procedures not stated in the Graduate School bulletin.

TECHNOLOGICAL AND ADULT EDUCATION

(362) Technological and Adult Education

MAJORS

DEGREES

Technological and Adult Education ......... M.S., Ed.D.

Vocational-Technical Education ......... M.S.

Education ......... Ph.D.

Gerald D. Cheek, Head

Professors:

Cameron, W. A., Ph.D. ............ Ohio State
Campbell, C. P., Ed.D. ............ Maryland
Cheek, Gerald D., Ph.D. ............ Kansas State
Coakley, Carroll B., Ph.D. ............ Wisconsin
Craig, D. G., Ed.D. ........ Cornell
Haskell, R. W., Ph.D. ............ Purdue
Matthews, John L., Ph.D. ............ Arizona State
Peters, John M., Ed.D. ............ NC State
Reed, J. L. (Emeritus), M.S. ............ Oklahoma State
Wagoner, George A. (Emeritus), M.S., Ed.D., Indiana Woodin, R. J. (Emeritus), Ph.D. ............ Ohio State

Associate Professors:

Brewer, Ernest, Ed.D. ............ Tennessee
Brockett, Ralph, Ph.D. ............ Syracuse
Hanson, R. Ph.D. ............ Purdue
Kastrow, Carol, Ed.D. ............ Georgia
Ledford, B. J., Ed.D. ............ Tennessee
Mann, E. C., Ed.D. ............ Penn State
Petty, G. C., Ph.D. ............ Missouri
Radder, B. J., M.S. ............ West Virginia

Assistant Professors:

Pierce, R., Ph.D. ............ Ohio State
Powell, Terrence L., M.S. ............ Oklahoma
Reynolds, Eunice, Ed.D. ............ Tennessee

THE MASTER'S PROGRAM

The Department of Technological and Adult Education offers graduate programs leading to the Master of Science with a major in Technological and Adult Education. The program is available with concentrations in adult education, business and marketing education, industrial education, industrial training, and vocational-technical education. The thesis option requires the completion of 33 semester hours including 6 hours of thesis. The non-thesis option requires the completion of 36 hours of coursework.
Details and specific requirements for the various degree options may be obtained from the coordinators of the service areas.

THE SPECIALIST PROGRAM

The Ed.S. program is a cooperative undertaking involving all vocational service areas. Concentrations are available in agricultural, business, marketing and distributive, home economics, industrial, and technical education, and in general vocational education.

The degree requires a minimum of 60 hours of graduate study. Credits earned for the Master's degree may meet program requirements in the courses which contribute to the program objectives of the candidate. A major core of studies offers advanced concepts in technological and adult education.

THE DOCTORAL PROGRAM

The comprehensive Ed.D. program in the department is designed to provide opportunities for graduate students to achieve professional objectives, develop needed competencies, and gain desirable experiences and understanding of technological and adult education.

The minimum requirements in the doctoral program consist of the following: departmental specialization, 12 hours; departmental core and electives, 24 hours; professional education core, 9 hours; research techniques, 12 hours; and dissertation, 24 hours. A minimum of 90 hours above the bachelor's degree is required.

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ed.D. programs in Technological and Adult Education are available to residents of the state of South Carolina; the Ed.D. program in Educational Administration is available to residents of Kentucky and West Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

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

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

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

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

439 Areas of Marketing (3) Marketing, personnel development, and management of trade organizations as they affect the professional leadership program in marketing education. Prereq: 432. F,Su

454 Training Aids Development (3) Study and preparation of instructional aids and non-print media commonly used by technical instructors and trainers. Prereq: Senior standing or consent of instructor. F,Su

455 Performance-Based Evaluation (3) Assessing the effectiveness of training programs through performance-based evaluation. Evaluation of incumbent job performance. Prereq: Senior standing or consent of instructor. Sp,Su

456 Organization and Operation of VICA/HOSA (3) Principles, organization, philosophies of professional activity in vocational technical programs. Prereq: Senior standing or consent of instructor. Sp,Su

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 toward degree requirements. May be repeated. S/N/C only. E

503 Problems in Lieu of Thesis (3) May be repeated. Maximum 6 hrs. S/N/C only. E

504 Research in Technological and Adult Education (3) Solution of problems encountered in technological and adult education. Research design, direction, and evaluation of technological and adult education. Prereq: 12 hrs of graduate credit. F,Su

505 Selection, Placement, and Follow-up Procedures in Technological and Adult Education (3) Methods and procedures utilized in establishing criteria for trainee selection and placement in instructional programs and job training. Collecting, analyzing, and reporting follow-up data appropriate for making program improvements. Prereq: Consent of instructor. Sp,Su

506 Adult Continuing Education: A General Survey (3) History, organization, development, philosophy of adult education agencies, associations, programs, issues, and literature illustrating process of adult education and diversity of continuing education. Prereq: Consent of instructor. F,Su

509 Internship in Technological and Adult Education (3) Practical field experiences in selected settings under supervision of practitioner and departmental representative. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

510 Foundations of Technological and Adult Educa-
tion (3) Historical, philosophical, economic, social, and psychological foundations of technological and adult education; fundamental principles and contemporary objectives. Prereq: Consent of instructor. F

511 Issues and Trends in Technological and Adult Edu-
cation (3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

514 Individual Study in Technological and Adult Edu-
cation (3-12) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

515 Microcomputer Operations and Programming in Edu-
cation (3) Operating procedures and BASIC pro-
gramming for educational and training applications. Hands-on experience in operating and programming microcomputers, writing, debugging, and running educational programs using sequential data files. Prereq: Teaching, administrative, or related experience in education or training, or consent of instructor. E

516 Microcomputer Software Development (3) Advance programming in BASIC, spread sheets, spreadsheets, and binary files, search and sort algorithms, and bitmapped graphics for educational environments. Hands-on learning and program development. Prereq: 515 or consent of instructor. E

518 Education Specialist Research and Thesis (3) May be repeated. Maximum 9 hrs. S/N/C only. E

521 Program Development and Operation in Tech-
nological and Adult Education (3) Theories and models from research to practice in planning and operating adult/education programs. Prereq: Consent of instructor. F,Su

522 Adult Development (3) Changes in characteristics of adults over life span and implications for adult education. Prereq: Consent of instructor. F,Su

523 Post-Secondary Education for Adults (3) History, evolution, philosophy, trends and implications of post-secondary education, university programs, their institutions, and clientele. Prereq: Consent of instructor. Sp,Su

524 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 510 or equivalent. Sp

530 Methods and Materials for VOE Programs (3) Development of instructional aids, research techniques, and evaluation methodologies 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 toward degree requirements. May be repeated. S/N/C only. E

531 Organization and Supervision of VOE and Mar-
ket Programs (3) Developing office and marketing strategies, guidelines, and office procedures. Trends in office and marketing education, physical facilities, state plans, instructor qualifications, and advisory committees. Prereq: Consent of instructor. F,Su

532 Improvement of Instruction in Basic Business and
Marketing Education (3) Issues, research findings, methods, and materials for instruction in both secondary and post-secondary levels. Prereq: 12 hrs of graduate credit. Sp,Su

533 Improvement of Instruction in Office Technology (3) Research, principles of learning issues, and materials in typical office role and office communications, and office procedures. Prereq: Consent of instructor. Su

534 Improvement of Instruction in Accounting and Data Processing (3) Principles of learning, issues, research findings, and materials in basic accounting, automated accounting and data processing at secondary and post-secondary levels. Prereq: Consent of instructor. F,Su

535 Curriculum in Business and Marketing Educa-
tion (3) Curriculum designs in career, secondary, post-secondary education, Legislation, technology, social, economic and research results that affect business and marketing education. Prereq: Consent of instructor. F,Su

536 Organizing and Teaching Adult Business and Mar-
teting Education (3) Planning, organizing, promoting, teaching, and evaluating continuing education programs in business and marketing education; utilizing trade associations, employment agencies, business communications and office procedures. Prereq: Consent of instructor. Su

537 Measurement in Business and Marketing Educa-
tion (3) Testing and evaluation of learner performance in business and marketing education; teacher-made tests. Prereq: Consent of instructor. Sp,Su

540 Special Topics in Business and Marketing Educa-
tion (1-3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

541 Practicum in Business/Marketing Education (3) Practical updating and upgrading experiences in non-traditional settings for business and marketing teachers. Prereq: 15 hrs of graduate credit. E

542 Problems in Business and Marketing Education (3) Selective research projects in business of teaching in business and marketing education and related areas. Prereq: Consent of instructor. E

550 Administration of Industrial Education Pro-
grams (3) Developing, staging, administering and evaluating trade, industrial and technical education programs in secondary and post-secondary school settings. Prereq: Consent of instructor. Sp,Su

551 Supervision of Industrial Education Programs (3) Techniques used to improve industrial education
558 Seminar in Industrial Education (1-3) Current projects (3) Proper selection and effective application of advanced methods of teaching technical personnel. Prereq: 551 or consent of instructor. Sp, Su

557 Advanced Methods of Teaching Technical Subjects (3) Preparation of educational specifications, site selection, and preparing teaching materials to others involved in process of planning technical-education facilities. Prereq: Consent of instructor. Sp, Su

554 Technical Program Planning (3) Instructional systems attending to analysis, design, development, implementation, and evaluation of trade, technical, supervisory and related training. Prereq: Curriculum development course and consent of instructor. F, Su

555 Curriculum Planning for Industrial Education Programs (3) Developing performance-based, criterion-referenced instructional programs. Prereq: 374 or 554 or consent of instructor. Sp, Su

556 Staff Development Programs (3) Strategies for assessing, planning, and implementing programs for professional development of vocational-technical personnel. Prereq: 551 or consent of instructor. Sp

557 Advanced Methods of Teaching Technical Subjects (3) Preparation of educational specifications, site selection, and preparing teaching materials to others involved in process of planning technical-education facilities. Prereq: Consent of instructor. Sp, Su

558 Seminar in Industrial Education (1-3) Current issues, innovations, problems associated with technical programs. Prereq: 12 hrs of graduate courses. May be repeated. Maximum 6 hrs. F, Su

559 Evaluation of Technical Training Programs (3) Internal and external evaluation of training programs to maintain quality control and/or to justify revisions. Prereq: 455 and consent of instructor. Sp, Su

571 Supervisory Skills for Improving Industrial Productivity (3) Philosophy of improving industrial productivity through quality and introduction to basic tools of statistical process control. Deming philosophy, control charting and interpretation, process capability, techniques for training hourly workers in quality control, and measurement procedures for quality control. Prereq: Statistics course and consent of instructor. F, Su

572 Advanced Training Methods for Industrial Productivity (3) Techniques of training hourly workers in use of statistical process control tools. Techniques for involving hourly workers and supervisors in quality assurance, inventory control, and productivity improvement groups. Prereq: 571. Sp, Su

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

601 Curriculum Planning in Technological and Adult Education (3) Curriculum theory, models, concepts, planning evaluation and implementation of specialized program areas. Prereq: 555 or equivalent. Sp, Su

602 Planning and Evaluation of Programs in Technical and Adult Education (3) Techniques utilized in planning, developing, and evaluating instructional programs. Prereq: 500-level planning course and consent of instructor. Sp, Su

604 Seminar in Technological and Adult Education (1) Required 2 consecutive semesters during doctoral residency. May be repeated. Maximum 3 hrs. S/NC only. E

605 Administration and Supervision of Technological and Adult Education (3) Leadership, policy, organization, planning, personnel, student development services, personnel, technical and adult education at secondary, post-secondary, and higher education levels. Principles, problem solving, and management. Prereq: Administrative theory course and consent of instructor. F, Su

610 Research Development in Technological and Adult Education (3) Proposal development, theoretical background, data collection, analysis of statistics, and evaluation of research in technological and adult education. Prereq: 6 hrs of advanced statistics courses and consent of instructor. Sp, Su

611 Internship in Technological and Adult Education (3) Field experience in relevant organizations. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs. E

613 Special Topics in Technological and Adult Education (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

615 Advanced Microcomputer Software Applications (3) Advanced programming and applications of intelligent or program-generating software. Progression of commercial relational data-base management program environments. Concepts and applications of communications and networking. Hands-on environment. Prereq: 510 or equivalent. Sp, Su


620 Seminar in Adult Education (3) Issues in adult education theories and concepts, philosophical positions, research trends and methodologies. Prereq: 510 or equivalent. F, Su

621 Advanced Seminar in Program Planning (3) Concepts, principles, and theories related to program planning in adult education. Prereq: 521 or equivalent. Sp, Su

622 Advanced Seminar in Adult Development (3) Adult development research and designing research for studies of life cycle. Prereq: 522 or equivalent. Sp, Su

626 Adult Problem Solving and Learning (3) Contemporary research and theories in adult problem solving and learning. Prereq: 360 or equivalent. F, Su


631 Higher Education in Business and Marketing Education (3) The Department of Textiles, Retailing, and Interior Design offers Master's degrees with majors in Interior Design and in Textiles, Retailing and Consumer Sciences. The program in Textiles, Retailing and Consumer Sciences offers concentrations in textile science and in retail and consumer sciences.

The Master's program in Interior Design will provide a balance of theoretical and practical training. Theoretical foundations of the field; emphasis is placed on the dissemination of knowledge. The program is accredited by the Foundation for Interior Design Education Research (FIDER). The goal of the graduate program in interior design is to provide the student with scholarly and professional experiences through seminars, studio work, and research. Interdisciplinary thrusts will increase the depth of understanding of the field of interior design essential to function as educators or as independent professionals. Areas of emphasis within interior design may include: historic preservation and adaptive use/history of interior design, computer-aided design, and human environment interaction. Supporting courses are available in lighting, furniture design, business practices, etc.

The programs in Textiles, Retailing and Consumer Sciences prepare students for careers in industry, business, public and private agencies, and educational institutions. Master's level work enables students to conduct research in retail management and merchandising and in the consumer related areas to retail decision making. Students in textile science are expected to have a solid foundation in mathematics, as well as a formal background in a physical science or engineering.

Interested students should contact the department head for more information.

ADMISSION REQUIREMENTS

A complete file for review includes the Graduate School application file, College of Human Ecology application, Graduate Record Examination (GRE) scores for the general test, and three Graduate School Rating Forms completed by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology. In addition to specified entrance requirements stipulated by The Graduate School, admission to the graduate program in Interior Design requires: 1) a background in interior design, 2) a cumulative GPA of 3.0 or above (on a 4.0 scale), and 3) a portfolio of undergraduate studio work (and professional work, if applicable) submitted to the department. The portfolio may include slides or original work. It is recommended that deficiencies in preparation, as identified in the admission process, be removed prior to full admission to the graduate program. Superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the department's graduate faculty.

THE MASTER'S PROGRAMS

Interior Design

The M.S. in Interior Design requires the completion of 36 hours of graduate credit. The requirements for the degree are as follows: in the major (510, 552, 564, and 590) 18-21 hours; a cognate area, 9 hours; research methods, 3 hours; a comprehensive design project with acceptable documentation, a
environment interaction and facilities management to further theory and application in advanced study and research. See the concentration environments concentration under Human Ecology.

Textile Science

Students enrolled in the Ph.D. program in Human Ecology with a concentration in textile science take one common course which provides a foundation for the integration of textiles and apparel in the context of the near environment. A required departmental research seminar exposes students to research being conducted in all areas of study in the department.

1. College Professional Seminar, HE 610 (3 hours);
2. RCS 552 (3 hours);
3. Research Methods which must include 6 hours of laboratory techniques in materials analysis and characterization;
4. TS 590 (2 hours). Attendance at seminar is required for all full-time students.
5. Six hours in statistics at the 500-600 level;
6. Eighteen hours in textile science courses;
7. Nine hours in a cognate area;
8. Fourteen hours of other courses which may include up to 6 hours of dissertation; and

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 UTK.

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 Knoxville on an in-state tuition basis. The M.S. program in Interior Design is available to residents of the states of Kentucky, Louisiana, or Virginia. The M.S. program with a concentration in retail and consumer sciences is available to residents of the state of Mississippi. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records. For the Ph.D., see Human Ecology.

Interior Design

GRADUATE COURSES

410 Environment as Code (3) Advanced theoretical issues in considering environment as medium of human communication. Prereq: 200, 400 or consent of instructor. Sp.


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

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

510 Needs Assessment and Design Programming (3) Use of systematic design methodology and design research methods as part of design problem-solving experience. Lecture and studio. May be repeated. Maximum 6 hrs. Prereq: Admission to graduate program. F

520 Integrative Interior Design Studio (3) Identification, integration and synthesis of multidisciplinary data input. Advanced programming techniques and design evaluation. Lecture and studio. Prereq: 510, 564, or consent of instructor. Sp.


542 Special Topics: History of American Interior Design (3) Philosophical and stylistic movements, America of seventeenth, eighteenth, or nineteenth centuries. Topics vary. Prereq: 475 or consent of instructor. May be repeated. Maximum 9 hrs. F

552 Seminar in Interior Design (3) Twentieth-century design concepts, persons, motivation, and creative components leading to visual innovation. Prereq: 470 or consent of instructor. Sp.

555 Micro-computer Research Applications in Interior Design (3) Advanced micro-computer concepts and applications for research in interior design. Project design and management, optimization of design criteria, programming, schematic design, computer-aided design, advanced spreadsheet and database analysis, and desktop presentation. Prereq: Consent of instructor. Sp.

564 Environmental Factors in Interior Design (3) Human factors and associated research techniques and design methodologies related to interior architectural environments. Design requirements from anatomy, physiology, anthropometry and social and behavioral sciences. Prereq: 6 hrs behavioral science and 6 hrs natural science, or consent of instructor. Sp.

570 Facilities Planning (3) Considerations in programming, design, management and operation of specialized facilities: hotels and restaurants, work environments, day care facilities, retailing-consumer interface and environments for elderly.

580 Directed Study in Interior Design (1-3) Independent advanced research in selected areas from field of interior design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

581 Directed Study in Historic Preservation (1-3) Independent advanced research in historic preservation relevant for interior design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

582 Directed Study in Historic Design (1-3) Independent advanced research in area of historic stylistic movements in interior design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

584 Directed Study in Environmental Design (1-3) Independent advanced research in environmental design analysis. Prereq: 574 or consent of instructor. May be repeated. Maximum 9 hrs. E

585 Directed Study in Facilities Planning (1-3) Independent advanced research in facilities management. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

590 Research Seminar (1-2) S/N only. E

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

510 Issues in Interior Design (1) Readings, reports, and discussion concerning unselected issues in interior design: history of interior design, his-
toric preservation, environment and behavior. Registration each semester of residence.

620 Advanced Special Topics in Interior Design (3) Subject matter not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 Retail Strategy and Decision Making (3) Strategy, strategic management and strategic process in retail sector. Analytical decision-making skills in retailing. Retail industry structure. International differences in retail systems. Prereq: Retail Management or equivalent. Sp


540 Socio-Psychological Aspects of Apparel (3) Apparel and human behavior in social situations. Prereq: 6 hrs or equivalent from sociology and psychology.


552 Economics of Textile Complex (3) Economics consideration of U.S. textile complex. Quantitative approaches to industry structure, production, marketing, 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

562 Research Methods (3) Fundamentals of science method, advancement of science, methodology and method of research. Issues and concepts of basic and applied research. Prereq: Statistics 531 or equivalent. Sp

590 Research Seminar (1) Individual study in interior design. May be repeated. Maximum 9 hrs. Su

625 Integrative Facilities Design in Consumer Environments (3) Methodologies and skills necessary for creation of settings responsive to needs of users. Techniques for programmatic analysis and development goals, user requirements, technical, functional, and behavioral analysis of consumer in business and built environment.

630 Advanced Directed Study in Interior Design (3) Individual study in aspect of interior design culminating in scholarly paper. May be repeated. Maximum 6 hrs.
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 semester of required courses. Theatre 401, 310-311, and at least 3 hours in dramatic theory and criticism, 310-11 may be waived by proficiency examination. Students passing this examination must complete 3 hours in advanced theatre history and 3 hours in dramatic theory/criticism.

Students in the M.F.A. degree program are evaluated annually by juried performance or portfolio submission. Continuance in the program is with the approval of the faculty committee for the M.F.A. degree program. Satisfactory completion of the comprehensive exam is prerequisite to entry into the third year. Projects in Literature (Theatre 599, 6 hours) and oral defense 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 560 Design and Technical Production Seminar, and at least 3 hours in the projects courses. Theatre 401 Principles of Design is required the first year of residence. Theatre 430 Play Directing is required of scene design students lacking an appropriate undergraduate foundation in directing.

Acting

Theatre 520-21-22-23-24-25 Master Class are required, along with one course in directing and two hours each in voice and dance.

Directing

Required courses are 430 Directing, 520-21 Master Class for first year acting candidates and 9 hours of 536 Projects in Play Directing.

Playwriting

Required are 470-71 Playwriting, at least 12 hours of 573 Playwriting Seminar, and at least 3 hours of 585 Production Workshops.

Dramaturgy

An additional two courses in dramatic theory and criticism are required as are Theatre 570 Dramaturgy: Theory and Practice, at least 6 hours of 565 Production Workshops, 430 Play Directing, 3 hours of 536 Projects in Directing, and 12 hours of 573 Seminar and Projects. In addition, students must select an arts and humanities specialization comprising at least one year of language study plus 6 hours in the selected area.

REQUIREMENTS FOR SECOND MASTER'S DEGREE

Students admitted to the MFA program who have already earned a Master's or a doctoral degree may apply up to 12 credit hours from the previous graduate program to the MFA degree with approval of the student's committee, the Dean of the College of Liberal Arts, and the Dean of the Graduate School.

Any such credits approved from a previous graduate program would be from courses that are directly relevant to the student's MFA curriculum and must have been earned within the time limit (6 years) established for completion of the MFA degree.

GRADUATE COURSES

401 Principles of Theatrical Design (3) Fundamental principles of design, visual and structural relationships. Projects assigned to develop understanding and perception.

409 Stage Make-up (2) Problems in make-up design and application; character analysis, physiognomy and chiascuro. Prereq: 100

410 Dramatic Theory and Criticism (3) Theatre aesthetics from Aristotle to present.

420 Special Studies in Acting (3) Content varies. Exercises in selected concentrated areas such as style, techniques, approaches, e.g., Shakespeare, movement, humor. Prereq: Advanced Acting and consent of instructor. May be repeated. Maximum 9 hrs.

425 Applied Phonetics (3) Development of skills in transcription and reproduction of principal varieties of English Language in North America and Great Britain and selected dialects in North America. Prereq: Consent of instructor.


445 Advanced Costume Construction (3) Advanced studies in construction technique, tailoring, vacuum forming, plastic molding, and cobbing. Prereq: 345 or consent of instructor.

446 Costume Patternmaking (3) Draping patterns for period costumes. Corestry and study of historic patterns 1500-1800. 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 materials. Study of theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

454 Scenery Painting (2) Introduction to materials, techniques, and principles of craft. Gaining skill and understanding through studio experience. Prereq: Consent of instructor.


461 Special Effects in Lighting and Sound (4) Projects in special effects, creative application of technology. Problems solving, drafting, and execution of effects for production. Production participation required. Prereq: 260 or consent of instructor.

462 Advanced Lighting Design (3) Advanced problems in lighting design and theory, lighting musical theatre, opera, and dance. Prereq: 382 or consent of instructor.

463 Sound Design (3) Sound design for performing arts. Review of equipment and acoustical factors that affect sound production. Sound design plotted from selected pays. Final projects mixed, edited, and cued for production.

465 Introduction to Lighting Design for Non-Designers (3) Theory and practice of stage lighting design, relationship between designers and non-designers: directors, actors, choreographers, architects, etc.

470-71 Playwriting (3,3) Advanced instruction in writing of plays. Prereq: Consent of instructor.

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

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

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

501 Introduction to Graduate Research in Theatre (3) Research tools and methods for theatre artist and scholar.

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

510 Studies in Theatre History (3) Intensive study of selected topics in theatre history. May be repeated. Maximum 9 hrs.

520-21-22-23-24-25 Master Classes in Acting (4,4,4,4,4,4) Master classes in acting techniques, voice, and movement. Theatre 430 Play Directing is required.

536 Projects in Play Directing (3) Practical work in play direction involving various lengths and kinds of scripts. May be repeated. Maximum 9 hrs.

539 Play Production in the Secondary Schools (3) Principles and methods for directing high school dramatic programs.

542 The Social History of Costume (3) Study and analysis of costume as related to society's manners and mores, architecture and furniture.


545 Millinery for the Stage (2) Pattern making and construction techniques for hats from antiquity to present. Prereq: Consent of instructor.

546 Advanced Costume Patternmaking (3) Advanced studies in patternmaking period costume. Development of historic patterns through flat pattern method. Prereq: 446.

549 Projects in Costume Technology (1-3) Individualized studies in costume technology in theatre production. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


563 Projects in Scenic Design (1-3) Conception and completion of major projects, both hypothetical and actual, in scene design. May be repeated. Maximum 9 hrs.

554 Studies in Scenic Design (3) Advanced scenic design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 6 hrs.

560 Projects in Lighting Design (1-3) Conception and completion of major projects, both hypothetical and actual, in lighting design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

562 Special Problems in Lighting Design (3) Advanced problems in lighting design and theatre, problems in Broadway production and touring. Prereq: Consent of instructor.

563 Projects in Sound Design (1-8) Production assignment as sound designer on approved play and/or relevant projects in film, radio, television, radio, theatre, MFA students only.

570 Dramaturgy: Theory and Practice (3) Methods and materials. Prereq: Consent of instructor.
571 Seminar & Projects in Dramaturgy (3) Directed study and experience. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

573 Seminar in Playwriting (3) Exercises and projects tailored for advanced students in playwriting. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

575-76 Studies in Dramatic Theory and Criticism (3,3) Broad-based study of major ideas about drama.

580 Design and Technical Production Seminar (1-6) Selected aspects of scene design and technical production. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

585 Production Workshops (1-6) Directed experience in production collaborations. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

599 Project and Thesis (1-6) Available to theatre MFA students only. Prereq: Minimum of 30 hrs toward MFA degree and consent of advisor. May be repeated. Maximum 9 hrs.

Transportation
See Marketing, Logistics and Transportation

Urban Practice
(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine D.V.M.

D. J. Krahwinkel, Head

Professors:
Brace, J., D.V.M. ........................................ California (Davis)
Bright, R. M., D.V.M. ......................................... Ohio State
Dorn, A. S., D.V.M. ........................................ Illinois
Krahwinkel, D. J., D.V.M. .................................. Auburn
Legendre, A. M., D.V.M. .................................. Auburn

Associate Professors:
DeNovo, R. C., Jr., D.V.M. .................................. Illinois
Gompf, R. E., D.V.M. .......................................... Ohio State
Paddleford, R. R., D.V.M. ................................... Missouri
Seicler, R. R., D.V.M. ......................................... Texas A&M
Schmeitzel, L. P., D.V.M. .................................... Auburn
Sim, M. H., Ph.D. ............................................. Auburn
Wiegler, J. P., D.V.M. ......................................... Colorado State

Assistant Professors:
Adams, W. H., D.V.M. ........................................ Florida
Bright, J. M., D.V.M. .......................................... Purdue
Daniel, G. B., D.V.M. ........................................ Auburn
Harvey, R. C., D.V.M. ......................................... Tennessee
Jenkins, C. C., D.V.M. ........................................ Tuskegee
Klebanow, R. R., D.V.M. ..................................... Florida
Laratta, L. J., D.V.M. .......................................... Michigan State
Pardo, A. D., D.V.M. .......................................... California (Davis)
Ward, D. A., D.V.M. ........................................ Tennessee

Research Associate Professor:
Panjihpour, Masoud, Ph.D. ................................ Toledo

Clinical Associate:
Averis, S., D.V.M. ........................................... Tennessee
Shull, E. A., D.V.M. ........................................... Tennessee

Clinical Research Associate:
Sackman, J. E., D.V.M. .................................... Michigan State

Residents:
Arrington, K. A., D.V.M. .................................... Tennessee
Cook, S., D.V.M. ............................................. Minnesota
Graehl, R., D.V.M. ........................................... Auburn
Hawks, D., D.V.M. .......................................... California (Davis)
Hodges, R., D.V.M. .......................................... Tuskegee
McCraeckin, M. A., D.V.M. .................................. Georgia
Okrasinski, E., D.V.M. ....................................... Georgia
Purvis, D., V.M.D. ............................................. Pennsylvania
Ross, W., D.V.M. ............................................. Tuskegee

Interns:
Greek, J. S., D.V.M. ......................................... Wisconsin
McGhee, J., D.V.M. .......................................... Tuskegee
Means, T. L., D.V.M. ........................................ Michigan State

See Veterinary Medicine for program description.

GRADUATE COURSES

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

501 Special Topics in Small Animal Medicine and Surgery (1-4) May be repeated. Maximum 6 hrs. E

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

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

Veterinary Medicine
(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine D.V.M.

Comparative and Experimental Medicine M.S., Ph.D.

THE PROFESSIONAL PROGRAM

Admission Requirements
To qualify for admission to the professional program of the College of Veterinary Medicine, a candidate must have completed at least the minimum pre-veterinary requirements listed below. These may be completed at any accredited college or university that offers courses equivalent to those at The University of Tennessee, Knoxville, and must be completed by the end of spring term of the year in which the student intends to enroll. Biochemistry requirements must have been satisfactorily completed within five years of the time the student 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. An appropriate microbiology course may be approved if cellular or molecular biology is not offered.

Admission Procedures
Admission of new students is for the fall semester, with first priority given to residents of Tennessee.

Forms and instructions for making application for admission may be obtained, after September 1 each year, from Office of Computer Assisted Registration Services, 201 Student Services Building, The University of Tennessee, Knoxville, TN 37996-0200.

Applications must be completed and mailed in time to reach the UT Knoxville Director of Admissions by January 15 each year. All supporting documents, official transcripts, Veterinary College Admission Test (VCAT) results from a test taken with 24 months of the January 15 application deadline date, and letters of reference must arrive not later than 30 days after the application deadline date. NON- TENNESSEE APPLICANTS MUST HAVE A MINIMUM CUMULATIVE GRADE-POINT AVERAGE OF 3.2 ON A 4.0 SCALE.

Applications are accepted only from U.S. citizens or permanent residents of the U.S.

D.V.M. Curriculum
The curriculum of the College of Veterinary Medicine is a nine-semester, four-year program. Each class begins in August and graduates four years later in May. The first three years follow the traditional fall and spring semesters with the summer break following years one and two. The final year of the professional curriculum begins immediately following semester six and is a continuous clinical training schedule extending over one calendar year. The first year consists mostly of pre-clinical subjects such as anatomy, physiology, histology, and microbiology. Also included in this first year are subjects such as physical diagnosis and anesthesia. Considerable integration of subject matter is incorporated during this year.

The second and third years include the study of diseases, their causes, diagnosis, treatment and prevention and are team-taught on an organ system basis. The final year (three semesters) is devoted to intensive training in the solving of animal disease problems, including extensive clinical experience in the Veterinary Teaching Hospital. Each student will rotate through a series of clinical blocks.
An innovative feature of this curriculum is the designation of semester six as one in which the individual student may select his or her courses of study. This format allows selected students who have specific educational goals (such as advanced or dual degree programs) to enroll in all, some, or none of the regularly scheduled courses during that semester. Students are required to complete at least 16 credit hours and these hours will be credited toward the D.V.M. degree. This semester of elective study offers a unique educational alternative for selected students in paramedical subjects such as animal behavior, medical communication, professional ethics, jurisprudence, economics, and practice management.

The curriculum requires successful completion of 154 semester credits.

THE GRADUATE PROGRAM

The College also administers a graduate program involving all departments and leading to the Master of Science and the Doctor of Philosophy. Because of the interdisciplinary departmental administration of the College of Veterinary Medicine, the faculty have opportunities in the graduate programs of other instructional units, including Animal Science (nutrition, physiology, genetics and animal management), Microbiology (bacteriology, virology and immunology), Ecology (environmental toxicology), Public Health, and Comparative and Experimental Medicine. (Refer to other sections of this catalog for a full description of these programs.) The majority of the graduate students and graduate faculty of the College of Veterinary Medicine are involved in the Comparative and Experimental Medicine program. This program provides a wide spectrum of interdisciplinary training that prepares graduates for teaching and/or research careers in the health sciences.

ACADEMIC COMMON MARKET

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

PROFESSIONAL COURSES

811-12 Microbiology I, II (5.4) Pathogenesis of bacterial, viral and fungal diseases. Study relating microbial structure, metabolism and genetics to patterns of disease. Bacterial agents, antimicrobics, antigens and antibodies. Immunology, study of mechanisms of immune reaction, diagnosis and treatment, and role of immune response.

817 Special Problems in Microbiology (1-8) Extramural and specially designed study for students interested in select topics in bacteriology, mycology, virology and immunology.

821-22 Anatomy I,II (4.4) Gross and applied anatomy: neural structures of common domestic animals: dog, cat, horse, horse. Dissection of embalmed specimens, prosections, slide, models, and living animals.

823-24 Physiology I,II (4.4) Introduction to concepts and problems in physiology which form basis for clinical applications and for formal training in pharmacology, medicine, pathology, and surgery. Cellular, neural, cardiovascular, endocrine, digestive, endocrine, and reproductive physiology.

825-26 Histology/Anatomy (3.3) Histology and anatomy of animal body systems, structural and functional interactions of embryonic development from fertilization through organogenesis. Correlated with 823-24.

827 Special Problems in Animal Science (1-8) Extramural and specially designed study for students interested in select topics in anatomy, histology, and physiology.

830 Art of Veterinary Medicine I (1) Paramedical subjects important to veterinary medicine: practice management, interpersonal relations, communications, jurisprudence, ethics, careers, animal behavior and veterinary history. May be repeated. S/NC only.

831 Physical Diagnosis (1) Basic care, feeding, restraint, and handling domestic animals. Introduction to physical examination and diagnostic techniques used by veterinarians.

832 Anesthesiology (2) Principles of anesthesiology: pharmacology of anesthetic agents, and introduction to anesthetic techniques in veterinary medicine.

833 Epidemiology/Public Health (4) Principles of epidemiology and public health. Host-agent relationships, public health aspects of veterinary medicine, and role of veterinarian in public health.

834 Hematologic System (2) Pathophysiology, special pathology, and clinical management of diseases of the hematopoietic lymphoid organs and tissues. Principles, methods of laboratory evaluation of diseases of other organ systems.

835 Medical Interaction (2) Multidisciplinary laboratories and lectures of physiologic, pharmacologic and surgical concepts. Applied techniques in animal handling to facilitate anesthesia, surgery, post-surgical recovery and wound healing. Demonstration of physiologic and pharmacologic principles and introduction to instrument action to measure physiologic processes and drug effects.

836 Toxicology (2) Principles of toxicology, molecular mechanisms, pathologic processes and clinical features of animal diseases caused by common toxic agents.

840 Inegumentary System (2) Pathophysiology, special pathology, medicine and surgery of diseases of integumentary system. Laboratory examination, pathology, diagnosis and treatment.

841 Reproductive System (2) Pathophysiology, special pathology, medicine and surgery of diseases of male and female reproductive systems and mammary glands.

842 Alimentary System (5) Pathophysics, special pathology, medicine and surgery of diseases of alimentary system.

843 Musculoskeletal System I (3) Pathophysiology, special pathology, medicine and surgery of diseases of muscular and skeletal systems. Basic principles, pathologic changes and radiographic interpretation.

844 Musculoskeletal System II (2) Pathophysiology, special pathology, medicine and surgery of diseases of muscular and skeletal systems. Advanced principles, radiographic interpretation and surgical procedures.

845 Principles of Medical Science (2) Physiologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases: recent scientific advances in biomedical sciences.

846 Multiplicity Medicine (4) Anatomy, pathophysiology, medicine, and surgery of avian species, laboratory and zoo animals and reptiles. Species and diseases seen by practicing veterinarian. Current topics on foreign animal diseases.

847 Current Topics in Veterinary Medicine (1-3) Elective subjects in veterinary medicine: basic sciences, clinical specialties and issues related to veterinary practice.

848 Art of Veterinary Medicine I (2) Paramedical subjects important to veterinary practice: practice management, interpersonal relations, communication, jurisprudence, ethics, careers, animal behavior and veterinary history. May be repeated. S/NC only.

849 General Elective in Clinicals (2) Special rotation with clinical training in urban practice, rural practice, environmental practice and pathology. S/NC or letter grade.

850 Introduction to Clinicals (1) Clinical veterinary practice with discussion of case history, problem-solving and integration of basic sciences with clinical applications. Problem-oriented veterinary medical record.

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, medicine and surgery of diseases of endocrine system. Mecha

cisms of endocrine and metabolic diseases: therapy and prevention.

854 Respiratory System (3) Pathophysiology, special pathology, medicine and surgery of diseases of respira
tory system. Upper and lower respiratory system: infections and noninfectious diseases.

855 Radiology (3) Basic, advanced and special tech

niques in radiology with interpretation and use of radiologi
cal and histopathologic techniques in diagnosis and treatment of animal diseases.

856 Special Senses (2) Pathophysiology, special pathophysiology, 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 neuropathology.

858 Clinical Rotation in Specialties (2) Clinical training in specialty services: anesthesiology, ophthalmology or dermatology. Direct responsibility for diagnosis, patient care, and treatment of clinical cases in both urban and rural practice.

859 Clinical Clerkship (2) Advanced clinical training in urban practice, rural practice, environmental practice, and pathology. S/NC or letter grade.

861 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamic properties of veterinary drugs: mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies and clinical application.

865 Clinical Rotation in Environmental Practice (2) Clinical training in urban practice, rural practice, and specialty services: anesthesiology, ophthalmology or dermatology. Direct responsibility for diagnosis, patient care, and treatment of clinical cases in both urban and rural practice.

866 Special Problems in Environmental Practice (1-

2) Extramural and specially designed study for students interested in select topics in morphologic pathology, clinical pathology, veterinary medicine, pathology, veterinary clinical practice, parasitology and microbiologic techniques.

871 General Pathology (4) Principles of pathobiology: causes of disease, disturbances of cell growth, inflammation, and neoplasia.

873 Parasitology (3) Principles of parasitology: protozoology, helminthology, and epidemiology and relationship to diseases in animals.

875 Clinical Rotations in Pathobiology (2) Clinical training in laboratory diagnosis: post-mortem examination and clinical pathologic, parasitologic and microbiologic techniques.

876 Clinical Rotations in Pathobiology II (2) Clinical training and demonstrations in laboratory diagnosis: post-mortem examination and clinical pathologic, parasitologic and microbiologic techniques.

877 Special Problems in Pathobiology (1-3) Extramural and specially designed study for students interested in select topics in morphologic pathology, clinical pathobiology, veterinary medicine and microbiology.

881 Clinical Rotations in Urban Practice I (4) Clinical training in urban practice: basic sciences, clinical specialties and issues related to companion animals. Direct responsibility for diagnosis, care, and treatment of clinical patients.
Zoology

(Major in Liberal Arts)

MAJOR

Zoology

M.S., Ph.D.

Arthur C. Echternacht, Head

Professors:

Bagby, R. M., Ph.D. ..................................... Illinois
Bunting, Dewey L., Ph.D. ........................................... Oklahoma State
Carlson, J. G. (Emeritus) (Distinguished Prof.), Ph.D. ......................................... Pennsylvania
Chen, T. T., Ph.D. ............................................. Florida
Eckert, Arthur C., Ph.D. ........................................... Kansas
Ehrenreich, Ph.D. ............................................. California
Eiten, D. A., Ph.D. ............................................. Minnesota
Handel, Mary Ann, Ph.D. ........................................ Kansas State
Hochman, B. (Emeritus), Ph.D. ........................................ California
Jeon, K. W., Ph.D. ............................................. London
Joy, D. C. (Distinguished Scientist), Ph.D. ........................................ Oregon (UK)
Kennedy, J. R., Ph.D. ............................................. Iowa
Liles, J. N., Ph.D. ............................................. Ohio State
MacCabe, J. A., Ph.D. ............................................. California (Davis)
McCracken, G. F., Ph.D. ........................................... Cornell
Pimm, S. L., Ph.D. ............................................. New Mexico State
Richter, Susan E., Ph.D. ........................................... Wisconsin
Roth, L. Evans, Ph.D. ............................................. Chicago
Shivers, C. A., Ph.D. ............................................. Michigan State
Vaughan, G. A., Ph.D. ............................................. Duke
Weich, H. G. (Emeritus), Ph.D. ........................................ Florida
Whitson, G. L., Ph.D. ............................................. Iowa

Associate Professors:

Burnham, K. D. (Emeritus), Ph.D. ........................................ Iowa
Fox, David J., Ph.D. ............................................. Johns Hopkins
Greenberg, Neil, Ph.D. ............................................. Rutgers
Mclnon, B. D., Ph.D. ............................................. Michigan State
Pan, M. L., Ph.D. ............................................. Pennsylvania

Research Associate Professor:

Ashley, T. Ph.D. ............................................. Florida State
Tindall, R., Ph.D. ............................................. Penn State

Assistant Professors:

Boake, C. R. B., Ph.D. ............................................. Cornell
Dake, J. A., Ph.D. ............................................. Purdue
Ganguly, R., Ph.D. ............................................. Nebraska
Gittlerman, J. L., Ph.D. ............................................. Sussex
Hall, J. C., Ph.D. ............................................. Illinois

THE MASTER'S PROGRAM

Special requirements in Zoology are as follows: (1) completion of course requirements as determined by the candidate's faculty committee, including a course in biostatistics; (2) achievement of a 3.0 or better GPA in all courses taken for graduate credit; and (3) completion of a thesis.

THE DOCTORAL PROGRAM

Special requirements in Zoology are as follows:

1. courses as determined by the candidate's faculty committee, including a course in biostatistics;

2. an oral and comprehensive written examination in zoology and allied fields in which the candidate has had training;

3. a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language in the language department or (b) earning a grade of at least a B in the second semester of a special language reading course for graduate students.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES


504 Cytological Technique (2) Practical experience in cytological techniques. Prereq: Consent of instructor. Sp

505 Biostatistics (3) Biostatistics as applied to animal and human data. Prereq: Consent of instructor. Sp

506-06-11-12 Minicourse in Zoology (2,2,2,2) Select advanced topics in zoology. Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 4 hrs may apply toward zoology major.

403 General Genetics Laboratory (2) Experiments designed to illustrate basic principles of inheritance; primary organism—Drosophila. Prereq: Biology 220. 2 hrs.

404 Cytological Technique (2) Practical experience with variety of techniques: microscopy, embedding and sectioning, chromosome preparations, autoradiography, in situ hybridization, and immunofluorescence. Prereq: Biology 210. 2 hrs.

506-06-11-12 Minicourse in Zoology (2,2,2,2) Select advanced topics in zoology. Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 4 hrs may apply toward zoology major.

410 Advanced Cell Biology (3) Molecular and supramolecular structure and functions of eukaryotic cells: regulatory mechanisms, physiology, behavior and cell-cell interactions. Prereq: Biology 210. 220. 2 hrs and 1 lab.

420 Cell and Tissue Structure and Function (4) Study of animal cells and tissues at light and electron microscopic levels. Prereq: Biology 210. 220. 2 hrs and 1 lab.

430 Immunology (3) Same as Microbiology 430.

439 Immunology Laboratory (1) Same as Microbiology 439.


445 Comparative Animal Physiology (3) Comparison of diverse physiological mechanisms aiding in adaptation to particular habitats and lifestyles. Prereq: Biology
521 Advanced Mammalian Physiology I (4) (Same as Animal Science 521.)
522 Advanced Mammalian Physiology II (4) Respiratory, renal, gastrointestinal, and reproductive physiology, acid-base mechanisms, and metabolism. Prereq: 521. (Same as Animal Science 522.)
523 Physiology of Hormones (3) Cellular and organ-ismic action of hormones in invertebrate and vertebrate animals. Prereq: 490 or consent of instructor. Recommended prereq: Biochemistry 410. 2 hrs and 1 lab.
524 Physiological Ecology of Animals (3) Adaptive physiological response of animals to natural changes in or extremes of physical and biotic environment. Terres-trial vertebrates. Prereq: Undergraduate courses in animal physiology and ecology, 440 and Biology 230 or equivalent.
525 Physiological Ethology (3) Behavioral endo-crinology and neurology from ethological perspective; reciprocal relationships of physiology and behavior in natural contest. Term paper, review of assigned topic, creative development of special aspect. Prereq: 450 or undergraduate physiology, or consent of instructor.
526 General Vertebrate Neuroanatomy (3) (Same as Psychology 526.)
540 Insect Taxonomy I: Major Orders (3) Survey of classification of major orders of insects, with practical experience in identification of insects at family level. Prereq: Consent of instructor. 4 hrs combined lecture and lab.
541 Insect Taxonomy II: Minor Orders (3) Survey of classification of minor orders of insects, with practical experience in identification of insects at family level. Prereq: 540 or consent of instructor. 4 hrs combined lecture and lab.
542 Insect Structure and Function (3) Integrated study of morphology and physiology at tissue and cellular level of insects. Prereq: Consent of instructor.
543 Aquatic Insects (3) Taxonomy and biology of aquatic insects; immature forms. Prereq: Consent of instructor. 2 hrs and 1 lab.
544 Fresh Water Invertebrate Zoology (3) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Prereq: 360. 3 hrs lab and field study.
545 Advanced Animal Behavior (3) Second-level course in ethology, stressing evolution, genetics, physiology, ecology and human behavior. Prereq: 450 or equivalent. (Same as Psychology 545.)
555 Seminar in Quaternary Studies (3) (Same as Geology 555 and Botany 555.)
560 Biometry (3) Statistical methods in analysis of quantitative biological data. Prereq: Statistics course or consent of instructor.
573 Population Biology (3) Genetics and ecology of natural populations of plants and animals and aspects of behavior in determining population structure. Prereq: Introductory courses in ecology and genetics. (Same as Botany 575 and Ecology 573.)
583 Zoogeography (3) Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course or consent of instructor.
591 Foreign Study (1-15) See page 31.
592 Off-Campus Study (1-15) See page 31.
593 Independent Study (1-15) See page 31.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Advanced Topics (1-3) Readings and discussion of recent advances. Consult the departmental listing for offerings. May be repeated with consent of department. Maximum 9 hrs.
602 Seminar in Cell and Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.
603 Seminar in Genetics (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.