Fields of Instruction

Accounting and Business Law
(College of Business Administration)

MAJORS

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

Jan R. Williams, Head

Professors:

Dittrich, Norman E., CPA, Ph.D. .... Ohio State
Fisher, Bruce D., LLM ...... George Washington
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, MBA ....................... Northwestern
Reeve, James M., CPA, Ph.D. ..................... Oklahoma State
Roth, Harold P., CPA, Ph.D. ................. VPI
Stanga, Keith G. (Arthur Andersen Prof.), CPA, Ph.D. ...................... Louisiana State
Townsend, Mahlon L. (Emeritus), J.D. .......... Tennessee
Williams, Jan R. (Ernst & Young Prof.), CPA, Ph.D. ....................... Arkansas

Distinguished Lecturer:

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

Lecturers:

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

THE MASTER OF ACCOUNTANCY PROGRAM

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

Admission Requirements

Application deadlines for international students are: Fall and Summer, January 15. Application deadlines for U.S. citizens and permanent residents are: Fall and Summer, March 1. Although the program is designed for students who have completed an accredited baccalaureate degree program with a major in Accounting, those with outstanding undergraduate records in any area may earn the M.Acc. degree by completing prerequisites in accounting and by including courses in other business and related disciplines to supplement the applicant's undergraduate background. Students entering the program are expected to have completed coursework in calculus and computer science. For students with no previous exposure to calculus, Mathematics 503 is available. In addition to the general admission requirements for The Graduate School, M.Acc.

applicants are required to take the Graduate Management Admission Test (GMAT) and submit information on forms provided by the College of Business Administration. Applicants whose native language is not English must submit 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):
Three concentrations are available:
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. 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 the Test of English as a Foreign Language (TOEFL).

Course Requirements for the M.Acc. Program

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

CONCENTRATIONS

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

Ph.D. Concentration: Accounting

This degree provides a research-oriented terminal qualification for those seeking entry-level faculty positions in accounting. Students take approximately three years of coursework beyond the bachelor's degree, including a doctoral sequence designed to expose students to various areas of accounting research. Courses in accounting and other areas are selected to supplement the student's individual background and to prepare the student in an 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, 512, 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/N only. E

504 Financial Accounting Issues in Business Decisions (3) Comprehensive investigation of financial reporting issues relating to decision making. Economic consequences of generally accepted accounting principles, role of financial information in market economy, and specialized topics in financial reporting. Prereq: Admission to M.Acc. program or consent of instructor.

505 Taxation for Business Decisions (3) Conceptual foundation 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: Admission to M.Acc. program or consent of instructor.

511 Seminar in Accounting Theory (3) Analysis of conceptual framework; general-purpose external financial reporting by business enterprises; frame of reference for generally accepted accounting principles and alternative principles. Prereq: Advanced Accounting and admission to M.Acc. program or consent of instructor.

512 Selected Topics in Current Accounting Theory and Practice (3) Critical in-depth consideration of current issues. Alternative solutions to emerging topics. Prereq: 511 and admission to M.Acc. program or consent of instructor.

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

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: Admission to M.Acc. program or consent of instructor. 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: Cost and Managerial Accounting and admission to a graduate business program or consent of instructor.

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

531 Tax Research and Planning (3) Development of expertise in tax research utilizing authoritative sources of tax law and advanced study of tax alternatives available to minimize tax liability compatible with achieving taxpayer objectives. Prereq: Federal Income Taxation and admission to M.Acc. program or consent of instructor.

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

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

534 Unified Estate and Gift Transfer Taxation (3) Taxation of wealth transfers; transfers at death, inter vivos transfers, and generation skipping transfers. Income taxation of estates and trusts. Determination and payment of state and federal wealth transfer and income taxes. Prereq: Federal Taxation and admission to M.Acc. program or consent of instructor.

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 and admission to M.Acc. program or consent of instructor. 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: Accounting Information Systems and admission to a graduate program or consent of instructor.

542 Systems Analysis and Design (3) Analysis and design of information systems for management and distribution of economic information about organizations. Prereq: Accounting Information Systems and admission to a graduate program or consent of instructor.

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

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: Admission to M.Acc. program or consent of M.Acc. advisor.

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

594 Graduate Seminar in Accounting (3) Topics vary. Prereq: Admission to M.Acc. program or consent of instructor.

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

611-12 Doctoral Seminar in Accounting (3,3) Study of research methodology and application of various research methods in accounting literature. Prereq: Consent of Ph.D. program advisor.

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

Advertising

(College of Communications)

MAJOR

DEGREES

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:

Haley, Eric, Ph.D. ..................... Georgia

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 institution in a free-enterprise democratic society and its relation to social, legal, cultural, and economic institutions. F

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

580 Seminar in Advertising Issues (3) Salient 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
Agricultural and Extension Education

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREE

Agricultural and Extension Education ............ M.S.

Roy R. Lessly, Head

Associate Professors:

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

Associate Professor:

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

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

THE MASTER’S PROGRAM

Thesis Option

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

1. A minimum of 30 hours of graduate credit in courses approved by the student’s advisory committee. Six hours of thesis may be counted toward this requirement.

2. A minimum of 20 hours of graduate credit in courses numbered at or above the 500 level.

3. A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.

4. A minimum of 3 hours of graduate credit in coursework in either research methodology or statistics.

5. A final oral examination.

Non-Thesis Option

A candidate for the Master’s degree who elects the non-thesis option must successfully complete:

1. A minimum of 36 hours of graduate credit in courses approved by the student’s advisory committee.

2. A minimum of 24 hours of graduate credit in courses numbered at or above the 500 level.

3. A minimum of 12 hours of graduate credit in courses appropriate to the area of concentration taught in the department and a minimum of 6 hours taught from outside the department.

4. A minimum of 3 hours of graduate credit in coursework in either research methodology or statistics.

5. A creative component designed by the student and approved by the student’s advisory committee for 3 hours of graduate credit.

6. A written and oral comprehensive examination.

GRADUATE COURSES

411 Fundamentals of Agricultural Extension (3) History, philosophy, organizational structure, clientele served, major areas of program emphasis, teaching methods, and relationships with other educational agencies. Graduate credit for non-majors only. 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 students use University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

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. Result demonstration, method demonstrations, meetings, tours, audio-visual aids. Prereq: 411 or consent of instructor. Sp

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

524 Research Methodology (3) Social research design, hypothesis testing, sampling, survey construction, scaling, interviewing, data coding, basic descriptive and relational statistics, and presentation of results. Prereq: 436, 523, or consent of instructor.

525 Curriculum Planning in Agricultural Education (3) Models, principles and procedures for developing curricula in agricultural education and scheduling learning activities for planned instructional programs. Prereq: 436, 456 or consent of instructor.

526 Agricultural Education for First-Year Teachers (2) Developing competencies needed by first-year teachers for planning, organizing and conducting programs of educational experiences in agricultural education within the high school program. Prereq: 435, 436 or consent of instructor.

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

528 Advanced Techniques for Teaching Agricultural Mechanics (3) Teaching techniques; determining the competencies, organizing and managing instructional units. Prereq: 435, 436 or consent of instructor.

529 Supervised Occupational Experiences in Agricultural Education (3) Historical and philosophical bases for supervised occupational experience programs and organizational problems and procedures for conducting programs for farm and off-farm agricultural occupations. Prereq: 456, 436 or consent of instructor.

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

531 Extension History, Philosophy and Objectives (2) Historical and philosophical foundation of adult education in American agriculture, key figures, issues, legislation, movement, farmer organizations and programs. Cooperative Extension Service, origin, legislation and growth and nature of present-day objectives and programs. Prereq: 411 or consent of instructor. Sp

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

593 Special Problems in Agricultural and Extension Education (1-4) Special research and/or special reports based on supervised independent study. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

Agricultural Economics and Rural Sociology

(College of Agricultural Sciences and Natural Resources)

MAJOR DEGREES

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

Handy Williamson, Head

Associate Professors:

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

Assistant Professors:

English, B. C., Ph.D........ Iowa State
Jansen, K. L., Ph.D.............. Oklahoma State
Pompelli, G. K., Ph.D............ California (Davis)

The Department of Agricultural Economics and Rural Sociology offers programs of graduate study leading to the Ph.D. and M.S. The doctoral program includes concentrations in agricultural marketing and price analysis, agricultural policy, farm management and...
Agricultural Economics

GRADUATE COURSES

412 Agricultural Finance (3) Micro-finance, financial objectives, acquisition of debt and equity funds, capital investments, capital allocation, credit analysis, borrower and lender 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

420 International Agriculture Trade and Marketing (3) Real and monetary aspects of international trade and effect on agricultural commodity flows; partial equilibrium analysis of international trade in agricultural products; institutional aspects of international marketing of agricultural products. Prereq: Introduction to Agricultural Economics and Intermediate Microeconomics. 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 intergeneration transfer. Prereq: 342. 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 role as basis for natural resource use; externalities in 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. F

480 Agribusiness Firm Management (3) Plans, price formation, and marketing of agricultural products. Analysis of market structure, market behavior, market analysis, and evaluation. Prereq: 210 or consent of instructor. F

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

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

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

505 Microeconomic Analysis (3) Theory of utility maximization and demand, production, cost, firm behavior, and supply; price in product and factor markets; efficiency and welfare. Prereq: Calculus and Intermediate Microeconomics or equivalent. E

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

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

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

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

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

560 Advanced Rural Economic Development (3) Theoretical and historical perspectives on process of economic development; analyze role of agriculture, sectoral interdependence and trade in development; application of theory to specific development issues. Prereq: 440 or consent of instructor. Sp

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

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

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

620 Advanced Quantitative Methods (3) Discussion and evaluation of advanced statistical and mathematical techniques in current agricultural economics research. Prereq: 522, 524, and Economics 681-82, or consent of instructor. Sp,A

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 used for estimating agricultural supply relationships using regression techniques, production functions, mathematical programming, firm growth models and simulation in supply analysis. Prereq: 540 or consent of instructor. F,A

650 Analysis of Agricultural Markets (2) Advanced theory and application of market analysis. Analysis of technical and pricing efficiency and examination of issues in agricultural and food markets. Prereq: 450 and 550 or consent of instructor. Su,A

652 Consumer Demand and Food Consumption (2) Simultaneity of consumer decision making; food demand. Constraints on 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 issues in both international and domestic development. Prereq: 560 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. Su,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: 380 or consent of instructor. (Same as Sociology 580.) Sp

580 Advanced Rural Sociology (3) Application of sociological concepts and theory to analyze changing rural social and community indicators, and rural development processes. Prereq: 380 or equivalent. (Same as Sociology 585.) Sp

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

Fred D. Tompkins, Head

Professors:
Bledsoe, B. L., PE, Ph.D. .......... Oklahoma State
Henry, Z. A., PE, Ph.D. .......... NC State
Clemson Hamilton, D. W., Ph.D. .......... Pennsylvania State
Luttrel, D. H. (Emeritus), Ph.D. .... Iowa State
Mcdow, J. J. (Emeritus), PE, Ph.D. .......... Michigan State
Mote, C. R., PE, Ph.D. .......... Ohio State
Sewell, J. I., PE, Ph.D. .......... NC State
Shelton, C. H. (Emeritus), M.S. .......... VPI
Tompkins, F. D. (Liaison), PE, Ph.D. .......... Tennessee
Wilhelm, L. R., PE, Ph.D. .......... Tennessee

Associate Professors:
Freeland, R. S., PE, Ph.D. .......... Tennessee
Grandle, G. F., Ph.D. .......... Tennessee
Wills, J. B., M.S. .......... Tennessee

Assistant Professors:
Baxter, D. O., M.S. .......... Missouri
Biswal, R. N., Ph.D. .......... Massachusetts
Buschermohle, Michael J., Ph.D. .......... Clemson
Clemson Hamilton, D. W., Ph.D. .......... Pennsylvania State
Hart, W. E., Ph.D. .......... Purdue
Prather, T. G., M.S. .......... Georgia
Wilkerson, J. B., Ph.D. .......... Purdue
Womac, A. R., Ph.D. .......... Tennessee
Yoder, D. C., Ph.D. .......... Purdue
Yoder, R. E., PE, Ph.D. .......... Colorado State

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.

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

THE MASTER'S PROGRAM

Agricultural Engineering

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

Agricultural Engineering 504 (1), 505 (1), and other major subject courses 12 hours
Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department) 6 hours
Program electives 6 hours
Thesis 500 6 hours

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

Agricultural Engineering Technology

Thesis Option: Applicants who have not previously earned a degree from a professionally accredited program within the U.S. must submit scores from the GRE general examination. Applicants accepted into the program must complete at least 30 semester hours to earn a degree. Of these 30 hours, 20 must be in courses numbered 500 or greater (6 hours of thesis plus 14 hours of other courses). Other specific requirements for the 30 hours are:

Agricultural Engineering Technology 504 (1), 505 (1), and other major subject courses 12 hours
Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department) 6 hours
Program electives 6 hours
Thesis 500 6 hours

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

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

Agricultural Engineering Technology 504 (1), 505 (1), and other major subject courses 12 hours
Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department) 6 hours
Program electives 6 hours
Coursework in special emphasis area 6 hours
Capstone Experience (project and report, typically 508) 3 hours

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

THE DOCTORAL PROGRAM

Departmental Requirements

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

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

Major subject courses 18 hours
Coursework in computational methods (mathematics, computer science, statistics, or any course containing appropriate computational components that may be approved by the department) 9 hours
Program electives 21 hours
Seminar (504, 505, or equivalent courses) 3 hours
600 Dissertation 24 hours

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

In addition to completing the 33 semester hours, non-thesis students must pass a comprehensive written final examination covering the graduate program, including the capstone experience. At the discretion of the candidate's committee, an oral examination may also be required.
In addition to completing the minimum 75 hours of graduate credit required for a degree, each doctoral student must also pass a comprehensive examination as required by The Graduate School.

**Agricultural Engineering**

**GRADUATE COURSES**

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

423 Irrigation and Waste Management System Design (3) Design of irrigation and agricultural waste management systems with consideration given to livestock waste characteristics, climate, water quantity, system characteristics, and impact on crop yield and water quality. Prereq: Soil and Water Conservation and Engineering Lab. 1 hr and 2 labs. F

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

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

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

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

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

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

505 Professional Communications Seminar (1) Reviews, reports and discussion of ideas, recent advances and current topics: presentations by students. Prereq: 504. May be repeated in doctoral program. Maximum 2 hrs. (Same as Agricultural Engineering Technology 505.) S/NC only. F, Sp

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. F, A

520 Agricultural Engineering Instrumentation (3) Modern instrumentation techniques. Static and dynamic response of instrumentation; signal conditioning; temperature, moisture, optical radiation, displacement, strain, pressure, velocity, acceleration, and flow measurements; digital data acquisition and control. Prereq: 410 or equivalent. Prereq: 451 or Electronics and Computer Circuits or equivalent. 2 hrs and 1 lab. Sp, A

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

575 Applied Microbiology and Bioengineering (3) Same as Chemistry 575. Introduction to Environmental Engineering 575, and Microbiology 575. E

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

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

630 Feedback and Control Systems (3) Differential equations for physical systems: solutions, transforms, and system response. Types of control, frequency response, system compensation, and system analysis. Application to agricultural systems. Prereq: 451, Mathematics 231, Basic Engineering 101, 201, or equivalent. 2 hrs and 1 lab. F, A

640 Research Project in Agricultural Engineering (2) Research and manuscript preparation for a technical meeting presentation and submission to refereed journal. Manuscript content significantly different from the dissertation and final report. S and A allow. E

650 Selected Topics in Agricultural Engineering (3) Lecture, group discussion, and individual study on specialized developments. May be repeated. Maximum 6 hrs. Sp

**Agricultural Engineering Technology**

**GRADUATE COURSES**

422 Food and Process Engineering Technology (3) Application of basics of chemistry, physics, 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

482 Small Internal Combustion Engines (3) Theory, concepts, and mechanics of small internal combustion engines; theoretical cycles; selection, operation, adjustment, troubleshooting and repair of single-cylinder engines. Prereq: Introductory Physics or consent of instructor. 2 hrs and 1 lab. Sp

482 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

492 Food and Process Engineering Technology (3) Application of basics of chemistry, physics, 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

492 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

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

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

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

505 Professional Communications Seminar (1) Reviews, reports and discussion of ideas, recent advances and current topics: presentations by students. Prereq: 504. May be repeated in doctoral program. Maximum 2 hrs. (Same as Agricultural Engineering Technology 505.) S/NC only. F, Sp

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. F, A

520 Agricultural Engineering Instrumentation (3) Modern instrumentation techniques. Static and dynamic response of instrumentation; signal conditioning; temperature, moisture, optical radiation, displacement, strain, pressure, velocity, acceleration, and flow measurements; digital data acquisition and control. Prereq: 410 or equivalent. Prereq: 451 or Electronics and Computer Circuits or equivalent. 2 hrs and 1 lab. Sp, A

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

575 Applied Microbiology and Bioengineering (3) Same as Chemistry 575. Introduction to Environmental Engineering 575, and Microbiology 575. E

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

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

630 Feedback and Control Systems (3) Differential equations for physical systems: solutions, transforms, and system response. Types of control, frequency response, system compensation, and system analysis. Application to agricultural systems. Prereq: 451, Mathematics 231, Basic Engineering 101, 201, or equivalent. 2 hrs and 1 lab. F, A

640 Research Project in Agricultural Engineering (2) Research and manuscript preparation for a technical meeting presentation and submission to refereed journal. Manuscript content significantly different from the dissertation and final report. S and A allow. E

650 Selected Topics in Agricultural Engineering (3) Lecture, group discussion, and individual study on specialized developments. May be repeated. Maximum 6 hrs. Sp

**Agriculture**

(Graduate 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.

**Agricultural Science**

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

**MAJOR DEGREES**

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

Kelly Robbins, Head

Professors:
Barth, K. M. (Emeritus), Ph.D. .......... Rutgers
Bell, M. C. (Emeritus), Ph.D. .......... Oklahoma State
Bleuer, J. K., Ph.D. .......... Ohio State
Chamberlain, C. C. (Emeritus), Ph.D. .......... Iowa State
Erickson, B. H., Ph.D. .......... Kansas State
Hall, O. G., Ph.D. .......... Iowa State
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
Miller, J. K., Ph.D. .......... Georgia
Murphee, R. L. (Emeritus), Ph.D. .......... Wisconsin
Oliver, S. P., Ph.D. .......... Ohio State
Robbins, K. R., Ph.D. .......... Illinois
Shirley, H. V. (Emeritus), Ph.D. .......... Illinois
Shrode, R. R. (Emeritus), Ph.D. .......... Iowa State
Schultz, T. W., Ph.D. .......... Tennessee
The Department of Animal Science offers graduate programs leading to the Master of Science and Doctor of Philosophy with a major in Animal Science. On the M.S. level, areas of concentration are nutrition, breeding, physiology (reproductive, mammary, and metabolic), and management with orientation towards beef cattle, dairy cattle, swine, and poultry. Since the department is also a part of the College of Veterinary Medicine, the areas of anatomy, systemic physiology (blood, cardiovascular, and neural), and histology are also available. The Ph.D. program offers concentrations in animal nutrition, animal breeding, animal physiology, animal anatomy, and animal management. For specific information, contact the department head.

During the first fall term of matriculation in each degree program, all graduate students are required to enroll in 555. Students are also required to enroll in 556 each fall term, and in 557 each spring term.

THE MASTER'S PROGRAM

For admission to the M.S. program, a student must have obtained a 3.0 grade-point average on a 4.0 scale (or a 3.0 each term during the junior and senior years) in a completed undergraduate degree program in one of the animal sciences or in a related area. The student must submit evidence (letters of recommendation, personal interview, etc.) that indicates ability to complete requirements for the M.S. Prerequisite courses may be required if the student has insufficient undergraduate background. If the student has an unsatisfactory grade-point average, acceptance may be on a probationary (non-degree) basis and a minimum of 9 hours of graduate coursework must be completed in the first term with a minimum grade-point average of 3.0 for admission to the M.S. program.

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

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

THE DOCTORAL PROGRAM

The doctoral program requires a minimum of 48 semester hours of coursework beyond the B.S. and a minimum of 24 hours of doctoral research and dissertation. The 48 hours of coursework must include:

1. A minimum of 16 hours in related fields outside of animal science.
2. At least 24 hours credit at the 500 and 600 level, exclusive of doctoral research and dissertation, of which a minimum of 6 hours must be at the 600 level. Students in the nutrition, breeding, physiology, or anatomy concentration must complete at least 12 hours at the 500 and 600 level in the respective concentration or closely related area. Students in the management concentration must complete Animal Science 531 and 9 hours at the 500 or 600 level in two non-management concentrations for a total of 12 hours (including 531).
3. A minimum of 1 hour of Agriculture 512 in addition to that required at the M.S. level.
4. A minimum of 6 hours in 400-, 500-, or 600-level statistics courses approved for the ICGSP.

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

GRADUATE COURSES

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

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

440 Advanced Animal Breeding (2) Animal simulation and utilization. Prereq: 340 or equivalent. 1 hr and 2 labs. F

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

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

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

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

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

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

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

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

522 Principles in Physiological Recording (1) Theories of acquisition and interpretation of physiological data. Experiments; principles involved in obtaining physiological data from animals using modern recording devices. Supports Animal Science-Veterinary Medicine 521. 1 lab. F

523 Advanced Mammalian Reproduction (3) Current topics and "new frontiers" in reproductive biology. Prereq: 522. F

524 Advances in Mammary Physiology (3) Development, anatomy, and function of mammary glands; environmental interactions affecting mammary development and function; factors affecting yield and composition of mammary secretions. Prereq: 522 or consent of instructor. Sp

531 Analytical Techniques in Animal Sciences (3) Physical and chemical analyses of feeds, ingredients, strategies: industrial programs in swine, poultry, sheep, beef, and dairy cattle breeding, development, improvement, and utilization. Prereq: 400 or equivalent. 1 hr and 1 lab. Sp
Animal Science-Veterinary Medicine

See Veterinary Medicine for program description.

GRADUATE COURSES

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

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

521 Advanced Mammalian Physiology I (4) Membrane, neuron, central nervous system, muscle, cardiovascular system, and control mechanisms. Prereq: general undergraduate anatomy and physiology. Biochemistry 410 or equivalent or consent of instructor. Recommended prereq: Biochemistry 418. (Same as Zoology 521.) 3 hrs and 1 lab. F

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

535 Nutritional Aspects of Companion Animal Health (2) Nutritional concepts applied to veterinary management of normal and disease states for pets including dogs, cats, horses and exotic species. Prereq: 521 or equivalent knowledge of UTK mainframe and software package. 2 hrs and 1 lab. F

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

595 Colloquium in Animal Science (1) Orientation, teaching, research and extension programs, guidance in preparation of student's course of study and research plans. Required of graduating senior students in animal science program. S/NC only. F

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

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

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

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

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

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

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

Anthropology

College of Liberal Arts

MAJOR

DEGREES

Anthropology (A.A., Ph.D.)

Jan F. Simek, Head

Professors:

Bass, William M., Ph.D. Pennsylvania
Faulkner, Charles H., Ph.D. Indiana
Jantz, Richard L., Ph.D. Kansas

Parmalee, Paul W. (Emeritus), Ph.D. Texas A&M
Wheeler, Margaret C. (Emeritus), Ph.D. Yale

Associate Professors:

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

Research Associate Professor:

Chapman, Jeffrey, Ph.D. North Carolina

Research Assistant Professor:

Tardif, Suzette D., Ph.D. Michigan

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

THE MASTER'S PROGRAM

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 maximum of 24 of these hours must be in anthropology, including the following:

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

2. Successful completion of the required courses as specified above within the required time limits.

3. A minimum of 24 hours must be in anthropology, including the following:

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

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

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. Specific courses to be taken are determined by students and their advisory committees. Students should plan to devote a minimum of 4 years beyond the B.A. to attain the Ph.D.
3. Demonstration of competence in statistics by completing Statistics 531 and 532 with a grade of B or better.
4. Demonstration of knowledge of one foreign language. This language should normally be French, German, Russian, or Spanish, but another language may be substituted at the committee's discretion. This requirement may be met by:
   a. Successful performance on a language examination administered by the appropriate language department. Students electing this alternative should consult with their advisor.
   b. Completion of the intermediate (200 level) sequence of a language with a grade of B or better in the second semester.
   c. Completion of the second semester of specializations courses for graduate students with a grade of B or better.
   d. Written and oral comprehensive examination in three areas of specialization to be determined by the committee.
   e. 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 (concentration in zoarchaeology only), South Carolina or Virginia (concentration in cultural or zoarchaeology only). The Ph.D. program is available to residents of Alabama, Arkansas, Louisiana, Mississippi, South Carolina, or West Virginia. Additional information may be obtained from the Residency Assistant In the Office of Graduate Admissions and Records.

GRADUATE COURSES

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

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

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

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

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

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

435 Historical Archaeology Laboratory (3) Laboratory procedures for processing, identification, and interpretation of artifacts from Historical sites. Artifacts from the Historically East Tennessee sites used for class projects. Recommended prerequisite: Prehistoric Archaeology.

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

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

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

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

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

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

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

465 Urban Anthropology (3) Field anthropology and application of archaeological remains on historic urban sites in U.S. Lectures and field and laboratory research on urban sites in East Tennessee. Recommended prerequisite: Prehistoric Archaeology.

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

481 Mesoamerican (3) Museum of the Past (Same as Art 481.)

482 Mesoamerican (3) Exhibition Planning and Installation (Same as Art 482.)

484 Mesoamerican (3) Field Projects 1-12 (Same as Art 484.)


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

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

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


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

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

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

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

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

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

515 Medical Anthropology (3) Cultural Impact on disease patterns, theories of disease causation, and models of therapy. 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, or consent of instructor. Recommended prerequisite: Basic nutrition course.

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 system. Intersections of race and ethnicity with class and gender.

520 Seminar in Social Anthropology (3) Approaches to analysis and interpretation of major ethnographic and historical contexts. Intensive reading; evaluation and discussion of major ethnographic and historical contexts. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

521 Laboratory Studies in Social Anthropology (4) Examination and comparison of major vertebrate groups, shells of terrestrial and aquatic molluscs, in relation to animal remains from archaeological contexts. Basic osteology and shell characters of species encountered in archaeological sites; use of comparative collections. May be repeated. Maximum 9 hrs.

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

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

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

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

561 Archaeological Resource Management (3) Federal legislation and regulations affecting identification, protection, and management of archaeological resources. Professional ethics and responsibilities of federal and state agencies, public interest groups, and
564 Archaeology of Southeastern United States (3) Archaeological research on prehistoric American Indian cultures in Southeastern United States; Tennessee prehistory.

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


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

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

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

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

587 Laboratory in Forensic Anthropology (3) Discussion and lab experience with forensic anthropological techniques: radiographic analysis, dental examination, hair analysis, bone microstructure. Prereq: Human Origins, 480, 581 or consent of instructor, 2 hrs and 1 lab.

589 Anthropological Genetics (3) Application of population and quantitative genetic theory to study of human and nonhuman primate populations. Prereq: Consent of instructor.

591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

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

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

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

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

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

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

690 Selected Topics in Physical Anthropology (3) For doctoral students in biological anthropology. May be repeated. Maximum 6 hrs.

691 Selected Topics in Paleoanthropology (3) May be repeated. Maximum 6 hrs.

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

A personal on-site interview is desirable but not mandatory.

For Track 1 applicants, twelve semester hours in humanities and a basic understanding of physical principles, systems and analytical procedures, and mathematical principles and analytical procedures, a general knowledge of western architectural history, and a general understanding of the use of computers is also required. Track 2 applicants must also submit a portfolio of design and research work.

Degree Requirements

Track 1 requires a minimum of 48 semester hours of undergraduate preparation and 57 semester hours of graduate coursework, taking approximately 3 1/2 years of full-time study. Track 2 requires a minimum of 30 semester hours of graduate coursework. Both tracks require 6 hours of Thesis 500 with a public presentation and oral defense of the thesis. Retention in the program is contingent upon evidence of satisfactory progress toward the degree. Each student's progress will be reviewed each semester by the Coordinator of Graduate Studies. Any questions regarding progress will be reviewed by the Graduate Program Advisory Committee.

For further information, contact the School of Architecture.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The B.Arch. program in Architecture is available to residents of the states of Maryland, South Carolina, or West Virginia. Additional information may be obtained from the 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) Techniques of preservation: methods of analysis, history of materials and technology used in old buildings. Prereq: 403.

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 urban form and its 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 to present. Fertile Crescent: Indus Valley; Hindu, Buddhist, and Mughal architecture.

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

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

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


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

421 History of Landscape Architecture (3) Intellectual, 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.

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


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

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

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

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

473 Architectural Photography (3) Photography as an integral part of architectural design. Aesthetic and technical principles of photography applied to architectural 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 assistantship, if desired.
2. Three letters of recommendation from former professors or professionals in the field.
3. A portfolio to be evaluated by the faculty.

M.F.A. Requirements

1. Eleven hours of electives which may consist of any combination of courses offered by the University for graduate credit.
2. A minimum of 3 hours of art history for graduate credit.
3. A minimum of 3 hours of history of art.
4. Successful completion of 12 hours of studio in a concentration area. An inter-area program must be approved by the graduate faculty only after the second semester in residence. Ten hours of studio must be in second year courses (512, 514, etc.)
5. A portfolio to be evaluated by the faculty. Further information is available by writing to the Department of Art.

GRADUATE MINOR IN THE HISTORY OF ART

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

GRADUATE COURSES

400 History of Photography (3) Survey of history of photography from introduction of daguerreotype and calotype to more recent trends. Aesthetic and expressive uses of photography as medium for artistic expression.

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

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

403 Individual Class Projects in Fiber (3) Prereq: Introductory Computer Enhanced Design or consent of instructor. May be repeated. Maximum 6 hrs.

405 Advanced Computer Enhanced Design (3) Prereq: 404 or consent of instructor. May be repeated. Maximum 6 hrs.
409 Special Topics in Fiber/Fabric (3) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 12 hrs.

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

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


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


424 Ceramics: Clay and Glazes (3) Clay chemistry, clay bodies, glaze theory, glaze calculation, intensive formulating, mixing and testing of clay bodies and glaze formulas. Prereq: 321 and 322.

425 History of Ceramics Seminar (3) Ceramics from ancient through contemporary. Ceramics sculpture, and vessel forms and their individual presentations. May not be used toward art history requirement. Prereq: 321 and 322.

426 Kilns: Design, Construction and Operation (3) Designing kilns, traditional and modern refractories, construction methods, and operation of wood, gas, and electric kilns. Prereq: 321 and 322.

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


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

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

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


453 Advertising Illustration (3) Advertising illustration media and techniques as applied to product illustration. Prereq: 354.

454 Editorial Illustration (3) Editorial illustration media and techniques as applied to book, magazine, and newspaper illustration. Prereq: 453.

456 Graphic Design/Illustration Practicum (1-12) Practica! experience in design and illustration with possible rearrangement with department. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 12 hrs.

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

482 Intaglio III (3-6) Individual projects through advanced color printing methods and combinations with other print media. Prereq: 362. May be repeated. Maximum 12 hrs.

483 Lithography III (3-4) Individual projects through advanced color etching methods from stones and aluminum plates. Prereq 363. May be repeated. Maximum 12 hrs.


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

471 History of North American Art (3) Landmarks in painting, architecture, sculpture, and design from prehis-
Astronomy
See Physics and Astronomy

**Audiology and Speech Pathology**

*(College of Liberal Arts)*

**MAJORS DEGREES**

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

Patrick J. Carney, Head

Professors:

Asp, Carl W., Ph.D. ................. Ohio State
Carney, Patrick J. (Liaison), Ph.D.  Pennsylvania
Loper, Harold L., Ph.D. ............ Ohio State
Nabekle, Igor V., Sc.D. ............. Prague
Peterson, H. A., Ph.D. ............. Illinois

Silverstein, B., Ph.D. .............. Purdue

Associate Professors:

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

Assistant Professor:

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

**THE MASTER'S PROGRAM**

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

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

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

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

**THE DOCTORAL PROGRAM**

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

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

The program will normally consist of 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 minimum of 6 semester hours in the topic of major interest;
  - 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 experiences.

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

6. A final oral examination.

**ACADEMIC COMMON MARKET**

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

**GRADUATE COURSES**

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

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

434 Clinical Practice in Speech-Language Pathology (3) Prereq: 433 and consent of instructor. Enrollment for fewer than 2 hrs must have prior departmental approval. (Same as Speech Education 434.)

440 Voice Disorders (3) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 304, 326, or consent of instructor. (Same as Speech Education 440.)

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


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

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

494 Aural Habilitation/Rehabilitation of the Hearing Impaired (3) Psychosocial aspects, amplification components, characteristics, assistive devices, speech acoustics, speech perception, speech reading, parent-infant,
Aphasia (3) Historical review of aphasia literature, and speech pathology; laboratory assignments for familiarization of students with instruments for measuring speech and hearing processes.

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

Articulation and Voice Disorders (3) Current research in diagnosis and management of articulation and voice disorders. Prereq: Undergraduate courses in articulation and voice disorders or consent of instructor.

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

Clinical Practice in Audiology: Off-Campus Sites (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

Clinical Practice in Audiology: Off-Campus Sites (1-4) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

Clinical Practice in Audiology: Off-Campus Sites (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

Conceptual analyses of speech production and overall oral communication. Prereq: 517 or consent of instructor.

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.

Intramuscular and peripheral nervous systems, role in speech and language. Prereq: 434 or equivalents or consent of instructor.

Intramuscular and peripheral nervous systems, role in speech and language. Prereq: 434 or equivalents or consent of instructor.

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

Language Science (3) Seminar of theories and conceptual analyses of speech production and overall oral communication. Prereq: 517 or consent of instructor.

Laboratory assignments for familiarization of students with instruments for measuring speech and hearing processes.

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Lecture: Articulation and Voice Disorders (3) Current research in diagnosis and management of articulation and voice disorders. Prereq: Undergraduate courses in articulation and voice disorders or consent of instructor.

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Aviation Systems
(UT Space Institute)

MAJOR DEGREE
Aviation Systems ......................... M.S.

R. D. Kimberlin, Program Chair

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

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

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

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

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

THESIS OPTION
The thesis program involves satisfactory completion of the following requirements:

Research and Development Specialization
1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering (engineering management).
3. Six hours of electives from the major field, mathematics or engineering.
4. Six hours of Aviation Systems 500 or Aviation Systems 550 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 or Aviation Systems 550 demonstrating the ability to conduct and report on an independent investigation.

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

Research and Development Specialization
1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering (engineering management).
3. Twelve hours of electives in the major field, mathematics or engineering.
4. Three hours of an assigned project under Aviation Systems 550.
5. A comprehensive final written examination on all coursework submitted for the degree and defense of the project course paper.

Graduate Dean

The non-thesis program will be permitted in

non-thesis program involves a minimum of 33 semester hours credit.

The thesis program involves a minimum of 30 semester hours credit.

both the thesis and non-thesis programs.

GRADUATE COURSES
500 Thesis (1-15) P/NP only. E
501 Aviation Systems: An Overview (3) Aviation systems, present and future. Socioeconomic base, aerospace and propulsion technology, meteorology, air traffic control, airport community interface, and technological trends and developments pertinent to present status and future development of air transportation.

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

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


505 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative 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, team work and decision-making process.

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


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

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

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

Biochemistry
(College of Liberal Arts)

MAJOR DEGREES
Biochemistry ............................... M.S., Ph.D.

John W. Koontz, Head

Professors:
Churich, George E., Ph.D. .......... Sheffield
Joshi, J. G., Ph.D. .......... Poona
Monte, Kenneth J., Ph.D. .......... Rochester
Salas, T. P. (Emeritus), Ph.D. .......... Michigan
Wicks, Wesley D., Ph.D. .......... Harvard
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 two approved graduate courses in chemistry, physics, or other physical science; for example, Chemistry 550, 551, 552, Physics 521, 522, 551. No survey courses will be accepted.
4. At least 6 hours of topics offered in 521 and 621.
5. Participation in 601 and 603 during the entire period of residence.
6. Comprehensive examination, taken before the end of the third year of study.
7. A dissertation reporting the results of original and significant research carried out during the term of candidacy.
8. A final oral examination which will be concerned primarily with the student's dissertation.

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

Petitioning for Master's Degree

Students who have passed the comprehensive examination in the Ph. D. program and have completed at least 30 hours of approved coursework for graduate credit, at least two-thirds of which must be at or above the 500 level, may petition the department for award of a Master's degree. The additional requirements for such a degree are:
1. The preparation of a research manuscript suitable for submission for publication in a major scientific journal and oral defense of that manuscript before an examining committee of three faculty members appointed by the head of the department, at least two of whom shall be members of the department; or
2. Publication of at least one full-length paper in a major biochemical journal as senior author.

GRADUATE COURSES

410 Cellular and Comparative Biochemistry (4) Electrolyte behavior; chemistry and structure of proteins; enzyme behavior and biological function; catabolism and energy capture; synthetic metabolism; nucleic acid function, protein synthesis, and biochemical genetics; regulation of biological processes. Prereq: Chemistry 350; 500-599 and Biology 110-20, 3 hrs and 1 discussion. F,Sp.
471-81 Biophysical Chemistry (3,3) Physicochemical principles with applications to biological systems. 471- Thermodynamics; chemical equilibrium; soluition 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 (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
511 Advanced Concepts in Protein Structure, Protein Function and Intermediary Metabolism (4) Protein structure and dynamics; regulation of enzyme activity; intermediary metabolism; membrane structure and function. Original literature and review articles; contemporary experimental approaches. Prereq: 410, 420 or consent of instructor. 3 hrs and 1 discussion. F
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. S/NC only.
515 Experimental Techniques I (3) Modern experimental methodology and instrumentation for departmental graduate students. Prereq: Consent of instructor.
516 Experimental Techniques II (3) Laboratory rotations. Students work in laboratory of faculty member on clearly defined project. Written proposal and oral report. Primarily for departmental graduate students. Prereq: 515. S/NC only.
521 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated. Maximum 9 hrs.
525 Graduate Research Participation (3-12) Tutorial laboratory experience. May be repeated. Maximum 12 hrs. E
561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; reproductive toxicology; mutagenesis, teratogenesis, carcinogenesis; pathologic changes and environmental impact. Prereq: 410, Chemistry 350-60-69 or consent of instructor. (Same as Ecology 561). F
600 Doctoral Research and Dissertation (3-15) P/NP only. E
601 Advanced Biochemistry Seminar (1) Invited speakers. Topics posted in advance. Required every semester in residence. S/NC only. F,Sp
603 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in field of chemical biology. Required every semester in residence. S/NC only. F,Sp
604 Current Topics in Environmental Toxicology (1) Critical reviews of research problems and methods in environmental toxicology, behavioral toxicology, biochemical and ecological effects, and statistics 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). S/NC only. F,Sp.
605 Current Topics in Regulation of Protein Function (1) Covalent modifications of proteins by phosphorylation-dephosphorylation; allosteric interactions. Prereq: 410 or equivalent. May be repeated. Maximum 6 hrs. S/NC only. F,Sp.
606 Current Topics in Biological Membrane Research (1) Prereq: 410 or equivalent. May be repeated. Maximum 9 hrs. (Same as Microbiology 606). S/NC only. F,Sp.
621 Advanced Topics (1-3) Biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, and physical biochemistry. Prereq: 511 or consent of instructor. May be repeated. Maximum 9 hrs.

Biomedical Sciences

(Office of the Vice Chancellor for Academic Affairs)

MAJOR DEGREES

Biomedical Sciences .................... M.S., Ph.D.
Raymond A. Popp, Director
Professor:
Olins, Donald E., Ph.D .................... Rockefeller
Research Professor:
Olins, Ada L., Ph.D ............... New York
Research Associate Professor:
Ch'ang, Lan-Yang, Ph.D ........... Vanderbilt
Research Assistant Professor:
Foote, Robert S., Ph.D .......... Duke
Underbacher, Edward C., Ph.D .... Pennsylvania

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

Bunick, Gerald J., Ph.D .................... Pennsylvania
Cook, John S., Ph.D .................... Princeton
Fry, R. J. M., M.D .................... Dublin
Fujimura, Robert K., Ph.D ............ Wisconsin
Godfrey, Virginia L., D.V.M., Ph.D .... Tennesse
Hartman, Fred C., Ph.D .............. Tennesse
Jacobson, K. Bruce, Ph.D ............. Johns Hopkins
Kannel, Steve, Ph.D .. California (San Diego)
Lafram, Frank W., Ph.D ............ Florida State
Lee, Kai-Lin, Ph.D .................... Tulane
Littlefield, Gayle, Ph.D .............. Georgia
Mazur, Peter, Ph.D .................... Harvard
Mural, Richard, Ph.D ................. Georgia
Niyogi, Sall K., Ph.D ................. Northwestern
Popp, Raymond A. (Liason), Ph.D .... Michigan
Ritchik, Eugene M., Ph.D .......... Duke
Russell, Liane B., Ph.D .......... Chicago
Shugart, Lee H., Ph.D .............. Tennessee
Snyder, Fred L., Ph.D ............ North Dakota
Solomon, A., M.D ............... Duke
Srivastava, Prem C., Ph.D ............ Lucknow

Solomon, A., M.D .................... Duke
Srivastava, Prem C., Ph.D ............ Lucknow
The University of Tennessee-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 the life sciences the talent and experience of that staff, as well as the most advanced research methods and technology.

The program of study, which incorporates a high faculty-student ratio, is based on 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 abilities.

Each student's curriculum is planned to meet individual needs, with the aim of giving: (1) strength in the basic sciences; (2) perception of the most advanced research methods and talent and experience of that staff, as well as the most advanced research methods and technology.

ADMISSION REQUIREMENTS

A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need prepublication 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 corrected 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 2059, Oak Ridge, Tennessee 37831-8077.

THE DOCTORAL PROGRAM

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

2. Three semesters of Biomedical Sciences Laboratory (531, 532, 533).

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

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

5. Passing both written and oral comprehensive examinations.

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

7. A final oral examination on the dissertation.

8. A formal seminar presentation of the dissertation research.

SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

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

1. Graduate credit or a proficiency in the following core courses: Biochemistry (511); Biophysical Biochemistry (514); Cell Biology (518-19); plus any three of the following courses: Genetics (515); Molecular Genetics (517); Statistics for Biologists (574); or Computing for the Life Sciences (525). Additional credits may be obtained (6 to 15 hours) with electives.

2. Thirty hours of approved graduate courses including 8 hours for thesis.

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

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

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

6. Passing a final oral examination.

GRADUATE COURSES

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

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

507 Physical Chemistry (3) Thermodynamics; phase equilibria; chemical equilibria; electrostatic force; surface chemistry; electrolyte solutions; kinetics; conductance; viscosity; diffusion.


514 Biophysical Biochemistry (3) Chemistry and biochemistry of phosphorylation; pyrimidines and nucleic acids; biosynthesis of RNA, DNA, and proteins. Energy levels and excited states of large molecules; optical instrumentation; adaptations to system perturbations; properties of macromolecules in solution; molecular solution; molecular conformations; inter- and intramolecular forces; principles of microscopy. Prereq: 511.

515 Genetics (3) Mendelian genetics, mitosis and meiosis, transmission genetics, mapping and linkage; genetics of phage, bacteria and eucaryotes; mapping, linkage, mutagenesis; cytoplasmic inheritance; mechanisms of recombination, chromosome structure and replication.

516 Cell Biology (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques; mitosis and meiosis; cell cycle; chromosome structure; nuclear RNA metabolism; nucleoli and ribosomal biogenesis; survey of specialized cells. Structure of genetic transmission and translation in bacteria. Coreq: 511.

525 Computing for the Life Sciences (3) Interactive computing. Mini- and micro-computing environments: Basic, Fortran, and Pascal programming; 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, macro-molecules, pathology, mammalian genetics coverage.

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

624 Chemistry and Metabolism of Lipids (2) Nomenclature, chromatographic isolation, chemistry, physical properties, and enzymeology and lipids. Hormonal action of prostaglandins and role of lipids in membranes, enzy- matic expression, and nervous tissue. Lipid biochemistry of mammals. Comparative aspects, lipid pathways in bacteria and yeasts. Prereq: 511, 514.

651-52-53 Advanced Topics in Biomedical Sciences (3,3,3) Current and future research developments: protein synthesis, protein enzyme and enzyme mechanisms; cytochemistry, and special topics. Either as tutorial or literature survey requiring substantial student preparation. May be repeated.

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


666 Cyto genetics (3) Chromosome structure, chromosomal alterations (mitosis and meiosis), mechanisms of induction of chromosomal alterations by radiation and chemicals, aneuploidy, chromosome mosaicism, and hybridization. Chromosome changes and cancer; human cyto genetics, sister chromatid exchanges, human genetic risk assessment, molecular techniques for analyzing chromosome changes. Prereq: 515.

Botany

(College of Liberal Arts)

DEGREES

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

Edward E. Schilling, Head

Professors:

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

Clebsch, E. C., Ph.D. ...................................... Duke

DeSelm, H. R. (Emeritus), Ph.D. ............... Ohio State
The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, biometry, cytology, cytogenetics, ecology, genetics, lichenology, morphology, mycology, phycology, physiology, pteridology, 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 biology subject portions of the Graduate Record Examination, at least three specific prerequisite courses but otherwise qualified may be admitted to graduate studies in botany. In such cases, the deficiencies should be removed as soon as possible, typically during the first year of the student's graduate program. The determination of deficiencies and the manner in which they will be removed will be decided upon by the student's pro-temp committee during the first meeting with the student.

THE MASTER'S PROGRAM

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

Thesis Option

The thesis program is the usual route taken by botany students for the M.S. It is important that the entering student promptly identify a major professor and a suitable research project. The requirements for the thesis option consist of the following:

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for a thesis. This must be completed before enrollment in Botany 500.
2. Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 600 level or higher.
3. Satisfactory completion of two hours at the 600 level.
5. Presentation of a 30 minute departmental seminar.
6. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

Non-Thesis Option

1. Satisfactory completion of 34 semester hours of approved graduate courses of which 30 semester hours must be in botany including Botany 503. At least two-thirds of the hours must be at the 600 level or higher.
2. Satisfactory completion of two hours at the 600 level.
3. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.
4. Satisfactory performance on a final written examination on all work offered for the degree. The student's committee may also require that an oral examination follow the written examination.

THE DOCTORAL PROGRAM

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

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

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

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

GRADUATE COURSES

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


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

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

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

451 Plant Tissue Culture (3) Methods for culture of cells, tissues, and organ groups; media preparation and maintenance of culture. Prereq: 110-20 or Biology 110-20 or equivalent. Chemistry 120-30 or equivalent. Recommended prereq: 310-20, 321, 412; Microbiology 310 or 319; Ornamental Horticulture and Landscape Design 330 and Plant and Soil Science 331.

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

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

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

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

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

507 Biological Illustration (3) Principles and applications of photography (B/W and Color) photomicroscopy, drawing, graphics and video for recording and presentation for research and publication of data in pictorial and graphic form.
509 Morphology and Evolution of Basidiomycetes
(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.

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

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

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

521-22 Advanced Plant Physiology I, II (3, 3) 521--Plant biochemistry and metabolism, respiration, photosynthesis, carbon partitioning, and biosynthesis of specialized plant products: terpenoids, alkaloids, phenolics and plant growth regulators. 522--Growth and differentiation. Prereq: 310 and at least 3 additional hrs in biological sciences. (Same as Forestry 530.)

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

536 Plant Communities and Plant Geography (4) Plants in communities and their classification and ordination. Geographic distribution of communities—their climates and soils or relationships. Prereq: 451. (Same as Geography 536.)

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


565 Phytoplankton Ecology (3) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, ecological theory applied to phytoplankton communities, and physiological adaptations by populations to environment. Prereq: 310 or consent of instructor.

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

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

581 Cyogenetics (3) Chromosome structure and behavior during mitosis and meiosis; methods used in relation to structural changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosomes from plant and animal species. Prereq: 310 and at least 6 additional hrs in biological sciences. (Same as Forestry 581.) Sp, A

582 Methods and Instrumentation in Laboratory Investigation (1) Project experience and theoretical background in various research methods, including field research, collection, chemical analysis, adsorption spectrometry, disc electrophoresis, paper electrophoresis, zonal and ultracentrifugation, gas chromatography, mass spectrometry, laboratory research, and laboratory experiment design. Prereq: 330, 360; Physics 121, 122. May be repeated. Maximum 5 hrs. S/N only.

583 The Field Research Problem (3) Conceptualization, planning, implementation of field research, collection, and preparation for research. Prereq: 431 or 535 or 573.

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

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

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


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

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

578 Applied Ecology (3) (Same as Zoology 837.)

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

Broadcasting (College 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. ............................... Missouri

Associate Professors:

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

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

Assistant Professor:

Buchman, Joseph, Ph.D. ............................. Indiana

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

Adjunct Professor:

Nelson, Linda, 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. Prereq: 410. 3 hrs and 4 labs. E

420 Television Sales and Promotion (3) Problems and solutions of television sales and promotion. Case studies in sales and sales management; use of ratings, and computers in sales presentation, radio-television campaigns. Experience in television sales and promotion. Prereq: Radio Sales and Promotion.

430 Producing for Television (3) Principles of television production and field production, both technical and creative. Writing, producing, shooting, and editing video stories and programs, 3/4 camera, recorders, and editing system. Prereq: 330. E


490 Radio & Television Management (3) Business policies and practices of broadcast operations, departmental function, cost and income analysis, leadership styles and techniques, mid-level management. Prereq: 410. 3 hrs and 3 labs. E


550 International Broadcasting (3) Broadcasting systems in other countries. Analysis of international broadcasting techniques. Prereq: 521 or 561, or consent of instructor. Sp

580 Seminar in Radio & Television (3) Sustained issues in broadcasting. Topics vary. International broadcasting, cable television, new technologies, corporate television, educational and public broadcasting, broadcasting and society. Prereq: Consent of instructor or admission to program. F

590 Advanced Radio & Television Management (3) Financial management of broadcast operations: budgeting, financial planning, accounting, and related techniques. Prereq: Consent of instructor. Prereq: 410. 3 hrs and 3 labs. F

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

598 Internship (3) Full-time (30-40 hrs per week) work experience in news, production, or sales and management with non-university professional organization. Educational experience beyond that required by the program. Final term paper. Prereq: Senior or graduate standing, completion of at least 15 hrs of broadcasting courses, GPA 3.0 or better, and consent of department head.

Business Administration (College of Business Administration)

MAJOR

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

The College of Business Administration offers two college-wide programs, the MBA and the Ph.D., with a major in Business Administration. Two tracks are available for the MBA: the regular, full-time program and an executive program. A dual degree program is also available with the College of Law leading to the J.D.-MBA degree. To obtain application materials, write or call:

Office of Graduate Business Programs, Suite 527, Stokely Management Center, College of
Academic Common Market

An agreement among southern states for sharing graduate programs allows legal residents of the 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 Florida (concentration in logistics and transportation only), Kentucky (concentration in logistics and transportation only), or West Virginia; the MBA is available to residents of Alabama, Arkansas, Florida (concentration in logistics and transportation only), or Louisiana. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

Academic Standards

A graduate student in the College of Business Administration whose grade-point average falls below 3.0 will be placed on probation. A student on probation will be 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. The MBA program is a two-year 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. Students must complete an internship with a company 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. Students must complete an internship with a company using those skills acquired during the first year.

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 one month 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) an 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 package. There is no automatic cut-off for either grade point averages or GMAT scores. However, admission preference will be given to applicants with full-time work experience after obtaining the undergraduate degree.

Prerequisites

College-level mathematics through at least one course in college-level calculus, taken within the past five 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 MBA core consists of two 15-hour courses, one taken each semester. The courses are taught by the MBA core faculty in an integrated fashion and through a year-long simulation requiring students to learn the functional fundamentals (accounting, finance, management, marketing) when they need to apply them to solving a specific business problem. The topics introduced within this course follow three major themes: the functional fundamentals (learned within a cross-functional framework); the role of the firm in society (with attention to stakeholder value, economics, and the ethical and legal environment of the firm); and personal and team development. Students will be exposed to the assessment and delivery of customer value, statistical process control, continuous systems improvement, and the role of quality in competitive organizations.

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

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

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

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

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

PRE-MBA PROGRAM

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

Admission requirements are higher than those normally expected of MBA applicants. Desired qualifications include a minimum 3.4 GPA and a GMAT score of 600 or higher. Students interested in the program are counseled initially in the Liberal Arts Advising Center regarding admission standards and Liberal Arts requirements. At the end of their second year, they have a conference with the Associate Dean for Academic Affairs and are advised of their prospects for formal admission. Students who are likely candidates are advised to take the Graduate Management Admission Test in October of the third year, and to submit an application to the MBA program. The admission decision is made by January of the third year.

Upon admission, students begin MBA coursework in the fourth year and are awarded a BA degree at the end of that year. Upon successful completion of the fifth year (minimum of 30 semester hours of graduate credit), the student receives the MBA degree.

DUAL J.D.-MBA PROGRAM

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferment of both the Doctor of Jurisprudence and the Master of Business Administration. The dual program saves the student approximately one semester or one academic year. Each term requires two residence sessions which are integrated with off-campus work in a structured program of study, case work, problem solving and analyses, and applications within the participant’s sponsoring organization. The off-campus work requires substantial and regular contact with program faculty and other participants.

The objective of the program is to develop executives able to lead change and enhance the success of their organizations. This program provides the context for managers to evolve their skills and perspectives from a functional focus to a broader set of strategic management skills and views that will equip them to provide leadership in a business environment that is changing rapidly in terms of global markets, information technology and workforce relationships. The curriculum utilizes the College’s recognized strengths in customer value, cross-functional systems and quality and is designed to involve the participant in applying these concepts within his/her organization during the course of study.

The program consists of three 12-hour core courses and a 9-hour sequence which is a project of design and analysis of a significant strategic issue in the sponsoring organization.

Admission Requirements

All participants begin and complete the program together in one twelve-month period. Sessions will usually begin in January of each year. The deadline for applications to the executive program of the MBA is July 1 of the previous year. International students and students whose native language is not English must meet special requirements for admission to The Graduate School of UT Knoxville, and they are advised to make inquiries well in advance of the MBA program application deadline.

To be considered for admission the applicant must be proposed by his/her company or organization and must submit a complete application file. A completed file includes the Graduate School of UT Knoxville transcript of prior college work, the MBA program application, two completed applicant recommendation forms, and the Graduate Management
Admissions Test (GMAT) score report. The first items should reach The Graduate School one month before the last MBA application deadline to allow for processing.

For admission to this program, primary consideration is given to the applicant's work history and the proposal from the sponsoring organization and to other activities that demonstrate the potential for leadership. Other criteria include scores on the GMAT and the Test of English as a Foreign Language (TOEFL) for those whose native language is not English. There is no automatic cut-off for either grade-point averages or GMAT scores.

Curriculum

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

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

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

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

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

Transfer Credits

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

Other Requirements

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

THE DOCTORAL PROGRAM

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

Admission Requirements

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

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

Program of Study

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

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

The Ph.D. program is highly flexible, offering a wide array of concentrations and cognates. Moreover, heavy emphasis is placed on individualized instruction and close student-faculty interaction. The student takes the form of regular classes, as well as 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
   - Finance
   - Behavioral Science
   - Legal Environment
   - Business Policy
   - Management
   - Calculus
   - Marketing
   - Computer Science
   - Statistics
   - Economics

All work in the above areas is subject to approval by the temporary doctoral advisory committee and the Associate Dean for Academic Affairs. Specific majors may have prerequisites listed above.

3. Basic Core: Economics 510 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.
4. Research Tools: A minimum of 9 semester hours of graduate research methods must be completed. At least 6 semester hours in statistics courses beyond Statistics 531 are required. The remaining 3 semester hours may be completed in additional statistics courses (not to include Statistics 531) or in other areas such as research methodology, management science, computer science, econometrics, and psychometrics.
5. Concentrations: The concentration is the focal point of the Ph.D. program. Students are expected to master the literature and research techniques in the concentration area and to do quality research as evidenced by the preparation of an acceptable dissertation. A minimum of 12 semester hours of coursework is required, including at least 9 hours of doctoral seminars.
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 comprehensive area examination is administered in two sessions of approximately four hours each and the cognate area examination in one session of approximately four hours. Written examinations may be supplemented with oral examinations. For a doctoral student having a cognate area in the College of Law, the results of only an oral examination may be deemed acceptable. Scheduling of comprehensive examinations is coordinated through the Office of Graduate Business Programs. Comprehensive examinations are generally offered during the fall and spring terms. Comprehensive examinations must be taken within five years of matriculation.

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

Doctoral Committee

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

Admission to Candidacy

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

Admission to candidacy must be approved 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

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

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

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

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

511 Executive Core II (12) Integrated semester course: one 11-day period in residence with students meeting, study and analyses during off-site periods. Integration of major business functions through strategic perspective, application of functional knowledge to tactical and strategic issues. Role of firm in society as it relates to economic, legal, and social issues. Strategic management/policy deployment topics. Strategic management of projects, determination and delivery of customer value. Cases, simulations, and exercises. Prereq: Admission to executive program of MBA. Coreq: 561.

551 Executive Core I (12) Integrated semester course: two 11-day periods in residence with students meeting and studying during off-site periods. Integration of major business functions through strategic perspective, application of functional knowledge to tactical and strategic issues. Role of firm in society as it relates to economic, legal, and social issues. Strategic management/policy deployment topics. Strategic management of projects, determination and delivery of customer value. Cases, simulations, and exercises. Prereq: Admission to executive program of MBA. Coreq: 561.


553 Executive Core III (12) Continuation of 552. One 11-day period and one two-week period of residence at international site. Research and study, analyses and applications within international organization. Role of firm in international business: global economic, legal, and social issues. Strategic management/policy deployment topics and organizational culture, design and change management for global competition. National and international current issues. Prereq: 552, Coreq: 563.

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

555 Management Project II (3) Company project. Continuation of 551. Diagnosis and analysis of strategic issue. Work within firm under guidance of faculty member. Coreq: 551, Coreq: 552.

556 Management Project III (3) Company project. Continuation of 552. Completion of analysis and presentation of report to senior management in sponsoring organization. Work within firm under guidance of faculty member. Prereq: 552, Coreq: 553.

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

Chemical Engineering

(College of Engineering)

MAJOR

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

Professors:

Bogue, Donald C., Ph.D. .... Delaware
Byers, Charles H. (Adjunct), Ph.D. .. California
Clark, Edward S., Ph.D. .... California
Counce, Robert M., Ph.D. .... Tennessee
Crawford, Lloyd W. (UTSI), Ph.D. .. Cincinnati
Cuberson, Olan L. (Emeritus), Ph.D. ...... Texas
Donaldson, Terry L. (Adjunct), Ph.D. .... Pennsylvania
Doss, James W. (Adjunct), Ph.D. .... Tennessee
Fellers, John F., Ph.D. .... Akron
Frazier, George C., Jr. (Condra Prof.), D.Eng.
Hansen, Marion G., Ph.D. .... Wisconsin
Hansen, John M. (Emeritus), Ph.D. .... Tennessee
Hsu, Hsien-Wen, Ph.D. .... Wisconsin
Moore, Charles F., Ph.D. .... Louisiana State
Perona, Joseph J., PE, Ph.D. .... Northwestern
Prados, John W. (University Prof.) (Liaison), PE, Ph.D. .... Tennessee
Scott, Charles D. (Adjunct), Ph.D. .... Tennessee
Thomas, Carl O., Ph.D. .... Tennessee
Watson, Jack S., Ph.D. .... Tennessee

Associate Professors:

Basaran, Osman A. (Adjunct), Ph.D. .... Minnesota
Bienkowski, Paul R., Ph.D. .... Purdue
Bruns, Duane D., Ph.D. .... Houston
Cochran, Henry D. (Adjunct), Ph.D. .... MIT
Davison, Brian H. (Adjunct), Ph.D. .... Cal Tech
Downs, James E. (Adjunct), Ph.D. .... Tennessee
Dolan, Tommy J. (Adjunct), Ph.D. .... Wisconsin
Scott, Timothy C. (Adjunct), Ph.D. .... Wisconsin
Sheth, Alu M. (UTSI), Ph.D. .... Northwestern
Teg, Ernest F. (Adjunct), Ph.D. .... Texas
Wang, Ting-Tao, Ph.D. .... MIT
Weber, Frederick E., Ph.D. .... Minnesota

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

THE MASTER'S PROGRAM

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

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

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

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

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

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

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

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

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must submit evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:

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

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

3. The comprehensive examination, consisting of a written part and an oral part. The written part covers thermodynamics, reactor analysis, and transport phenomena and separations.

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

GRADUATE COURSES

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

403 Introduction to Optimization (3) Principles and application of optimization techniques to chemical problems. Prereq: Mathematics 241.


440 Transport Phenomena (3) Momentum, heat and mass transfer processes, analogues, differential and macroscopic balances, applications involving molecular diffusion, simultaneous mass transfer and chemical reaction. Prereq: 340, F

461 Advanced Process Dynamics and Control (3) Process and control system simulation and advanced industrial system design. Cascade, feedback, multi variable, deadtime, adaptive, and nonlinear control system design. Both computer and laboratory work. Lab. Prereq: 360.


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.

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

501 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. S/NC only. 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 for loans before degree is completed. May be used for credit or audit. Prereq: 360, F

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

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

507 Application of Numeric Linear Algebra in Systems (3) Prereq: Linear Algebra with Application (121), or by permission. Concepts and methods of solving algebraic systems, eigenvalue problems and similarity transformations in solving difference and differential equations. Numerical computational aspects of various algorithms and methods for linear algebraic systems in optimization studies. Introduction to linear programming. Computer projects. Prereq: Graduate standing or consent of instructor. (Same as Electrical and Computer Engineering 507 and Mechanical Engineering 507.)

513 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solution; composition relationship between phases, solution behavior and application to macromolecules; introduction to microscopic approach to thermodynamics. Prereq: 507, 532.

531 Advanced Chemical Engineering Thermodynamics (3) Phase equilibrium in ideal and nonideal solution; composition relationship between phases, solution behavior and application to macromolecules; introduction to microscopic approach to thermodynamics. (Same as Materials Science and Engineering 541.)


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

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

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

lysts, catalyst deactivation, fluid-fluid and fluid-solid reac tors.

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

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

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


581 Industrial Pollution Prevention (3) Principles and practical aspects of industrial waste minimization. Regulatory environment, waste minimization strategies, economic analysis, process safety, case study: analysis of alternative waste minimization/management technologies. Prereq: Graduate standing in engineering or consent of instructor.

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

586 Measurement Science I (3) (Same as Nuclear Engineering 586, Aviation Systems 588, Civil Engineering 588, Mechanical and Chemical Engineering 588, Engineering Science and Mechanics 586, Mechanical Engineering 588 and Aerospace Engineering 588.)

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

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

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

641 Advanced Diffusion Processes (3) Fixed and fluidized bed operations, recent developments in separation processes. Prereq: 542.

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 system 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 575.)

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

**Chemistry**

(Office of Liberal Arts)

**MAJOR DEGREES**

**Chemistry**

M.S., Ph.D.

Gleb Mamantov, Head

Professors:

- Baker, D. C., Ph.D. ............... Ohio State
- Bollo, J. E., Ph.D. ............... Manchester
- Burt, William E., Ph.D. .......... Illinois
- Chambers, J. Q., Ph.D. .......... Kansas
- Compton, R. N., Ph.D. .......... Tennessee
- Dean, J. A. (Emeritus), Ph.D. .... Michigan
- Eastern, J. F. (Emeritus), Ph.D. .... California
- Fletcher, W. H. (Emeritus), Ph.D. .... Minnesota
- Grimm, F. A., Ph.D. .......... Cornell
- Guilocohn, G. (Distinguished Scientist), Ph.D. .... California
- Williams, T. F. (Distinguished Prof.), Ph.D. .... Illinois
- Vanhook, W. A., Ph.D. .......... Johns Hopkins
- Smith, W. T. (Emeritus), Ph.D. .... Ohio State
- Pagni, R. M., Ph.D. .......... Wisconsin
- Magid, L. J., Ph.D. .......... Tennessee
- Magid, R. M., Ph.D. .......... Yale
- Mamantov, Gleb (Distinguished Prof.), Ph.D. .... Louisiana State
- Peterson, J. R., Ph.D. .......... California
- Schweitzer, George K. (Distinguished Prof.), Ph.D. .... Louisiana
- Sepaniak, M. J., Ph.D. .......... Iowa State
- Smith, W. T. (Emeritus), Ph.D. .... Ohio State
- VanHook, W. A., Ph.D. .......... Johns Hopkins
- Wehry, E. L., Ph.D. .......... Purdue
- Williams, T. F. (Distinguished Prof.), Ph.D. .... Wisconsin
- Woods, C., Ph.D. .......... NC State
- Wunderlich, B. (Distinguished Scientist), Ph.D. .... Northwestern

**Associate Professors:**

- Adcock, J. L., Ph.D. .......... Texas
- Alexandratos, S. D., Ph.D. .... California
- Barnes, C. E., Ph.D. .......... Stanford
- Bartmess, J. E., Ph.D. .......... Northwestern
- Cook, K. D., Ph.D. .......... Wisconsin
- Feiglre, C. S., Ph.D. .......... Colorado
- Lane, C. A., Ph.D. .......... California
- Schell, F. M., Ph.D. .......... Indiana

**Assistant Professor:**

- Shibata, J. H., Ph.D. .......... Washington
- Xue, Z. B., Ph.D. .......... California

Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite one 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. Examinations in areas not covered in the graduate program in chemistry (at the 400 level or above), and a field-related field to make an overall total of 30 hours, including one of the following sequences: 530-31-32, 550-51-52, 570-72-73, 590-94-95, or three courses from 510-11-12-20. At least 14 hours of this graduate coursework must be at the 500 level or above.
5. A final oral examination.

**THE DOCTORAL PROGRAM**

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

The requirements for the Ph.D. in Chemistry (except for the chemical physics concentration) consist of the satisfactory completion of:

1. Research and a dissertation to give 24 hours of graduate credit in Chemistry 600. Registration must be continuous from the beginning of research.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar.
3. Prescribed remedial courses based on performance on entrance examinations.
4. Completion of the comprehensive examination series and defense of an original research proposal to give 2 hours of credit in Chemistry 601.
5. Eighteen additional hours in courses at the 500 level or above including at least one course above 601 and one of the following sequences: 510-12-13, 530-31-32, 550-51-52, 570-71-72-73, and 590-94-95.
6. A final oral examination.

The Ph.D. program with concentration in chemical physics may be conducted jointly with the Department of Physics, Requirements depend on the choice of the major department. Chemistry departmental requirements include passing the above degree requirements in chemistry with concentration in physical chemistry plus 6 additional hours in physics at the 500 level or above. Three of the additional physics hours can be used to satisfy the 18 hours requirement in item 5.

**GRADUATE COURSES**

430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, descriptive chemistry of elements, kinetics and 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 Biological Chemistry (3,3) (Same as Biochemistry 471-81.)

473-83 Physical Chemistry (3,3) Students may not receive credit for both 471 and 473 nor for both 481 and 483. 473-83: Properties of gases; first, second, and third laws of thermodynamics; chemical equilibrium; statistical thermodynamics; introduction to quantum chemistry. Prereq: Mathematics 122 or equivalent and 1 yr of general chemistry. Sp

479-83 Physical Chemistry Laboratory (2,2) Experiments on topics discussed in 471-81 or 473-83. Prereq or coreq: Corresponding courses 471 or 473 or 479 or 481 or 483 for 471-81. F

484 Advanced Physical Chemistry (3) Atomic and molecular structure, quantum mechanics of atomic and molecular systems, crystal structure and solid state. Prereq: 461 or 463. Sp

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

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

504 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.

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.

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, molecular orbitals, valence bond theory, covalent, ionic, and metallic bonding, ligand field theories, solid state. Prereq: 1 yr of physical chemistry.

531 Characteristics of Inorganic Compounds (3) Descriptive chemistry of elements, structure, reactions, kinetics, mechanisms, equilibria, and spectra of coordi-
350 Selected Topics in Inorganic Chemistry (3) Topics of current significance. Prereq: 530-51-52 or consent of instructor. May be repeated. Maximum 12 hrs.

560 Selected Topics in Physical 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.

Child and Family Studies

(Majors of College of Human Ecology)

MAJORS DEGREES

Child and Family Studies M.S.

Human Ecology Ph.D.

Connie Steele, Head

Professors:

Cunningham, Jo Lynn, Ph.D. ..... Michigan State
Fox, Greer L., Ph.D. ............... Michigan
Moran, James D., Ph.D. ....... Oklahoma State
Norquist, V. Mick, Ph.D. ........ Tennessee
Steele, Connie, Ed.D. .......... Texas Tech
Twardosz, Sandra (Liaison), Ph.D. ..... Kansas
White, Priscilla, Ed.D. ......... Tennessee

Associate Professors:

Allen, J., Ph.D. ............... Purdue
Buehler, C., Ph.D. ......... Minnesota
McInnis, Jackie H., Ph.D. ....... Florida State
Tegano, D., Ph.D. ......... Virginia Tech

Assistant Professors:

Caton, C., Ed.D. .............. Vanderbilt
Malia, Julla, Ph.D. ........ Iowa State
Smith, Delores, Ph.D. ....... Oklahoma State

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 is carefully planned in conjunction with a faculty committee to establish a program consistent with individual goals. All programs are characterized by a broad array of coursework, varied research experiences, and opportunities for experiences in applied settings.

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

ADMISSION REQUIREMENTS

A completed file for review includes a College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section, and completion of three

Graduate School Rating Forms by individuals who can attest to the potential for graduate education. Forms may be obtained from the department or Dean's Office, College of Human Ecology.

Admission to the program is contingent upon faculty evaluation of GRE scores, undergraduate/graduate GPA, rating forms, and work experience. Prerequisites for admission to the Master's or doctoral program are 8 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. Students should also consider an interdisciplinary minor in geology to provide a lifespan perspective to human development or family studies.

All students in the child development concentration must enroll in CFS 510, 533, and 571. At least 6 hours in a cognate area outside the department must be completed. Thesis students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of concentration, 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 concentration; and a written comprehensive examination.

Students in the family studies concentration must enroll in CFS 550, 571, and 540 or 560. At least 6 hours in a cognate area outside the department are required. Thesis students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in an area of concentration, 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 concentration; and a written comprehensive examination.

Students in the child development/early childhood licensure must enroll in College of Education courses: 574, 575, 591, and C&I 505. Thesis students are required to take the following: 3 hours of 500-level statistics; CFS 510, 512, 570, 571, and 3 hours selected from CFS 520, 521, 530, 540, 590; 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: CFS 570 or 3 hours of statistical methods or interpretation of methods and research methods, CFS 550, 512, 571; 12 hours selected from CFS 520, 521, 530, 540, 590; and a written comprehensive exam.

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

**THE PH.D. CONCENTRATION**

The doctoral program in Human Ecology prepares scholars in the concentration areas of child development and of family studies. The strength of the doctoral program is based on three major components: the integration of child development and family studies within the context of human ecology and related areas, concentration in child development or family studies, and an emphasis on becoming proficient producers and consumers of research. A doctoral program that is concurrently specialized and 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, 550, 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;
7. College Professional Seminar, Human Ecology 610;
8. Minimum 8 credits of electives.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state basis. The M.S. in Child and Family Studies is available to residents of 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
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 Survey of Theory and Research in Child Development (3) Theoretical models and research literature in child development (conception through adolescence); application to research intervention and education. Prereq: 9 hrs of either upper division undergraduate or graduate social science or consent of instructor. F
512 Survey of Research in Early Childhood Education (3) Current theories and issues in early childhood education. Prereq: 510 or equivalent or consent of instructor. Sp
520 Development and Evaluation of Curriculum in Early Childhood Education (3) Current curriculum models and curriculum issues in early childhood education from historical, philosophical, pedagogical and ethical perspectives. Description, analysis, and evaluation of program models; analysis of empirical bases for curriculum design. Experience in designing, implementing, and evaluating early childhood education curriculum for handicapped and nonhandicapped children. Prereq: 512, Sp, A
521 Organizations/Management in Early Childhood Education (3) Designing, implementing, and evaluating physical and human resources in educational environments. Development of skills in environmental organization, interpersonal leadership, and supervision of staff. Prereq: 512 or equivalent or consent of instructor.
522 Naturalistic Interventions for Parents and Teachers of Young Children (3) Common problems faced by parents and teachers; methods available to modify problem behavior. Prereq: 510 or equivalent or consent of instructor.
523 Families of Handicapped Children (3) Development of parents' experiences in caring for handicapped children, especially during infancy and early childhood. Prereq: 510 or consent of instructor.
540 Parent-Child Relations (3) Influence of parents on child development; influence of children on parents; reciprocal interaction between parents and children; applications of theories and research to family life problems. F
550 Survey of Theory & Research in Family Studies (3) Research issues and literature in family studies; use of family conceptual frameworks, development of theoretical concepts and application to research and family life programs. F
552 Family in Contemporary Social Thought (3) Alternative conceptualizations of family in current social thought. Variations of family construction by race, gender, and social class. Sp, A
560 Marital Dyad (3) Communication, power, sexuality, marital stability, and copings. Prereq: 550 or equivalent or consent of instructor. Sp
563 Family Life Education Programs (3) Planning, implementing, and evaluating programs in marital, parent-child, and family relationships. Prereq: Consent of instructor. (Same as Home Economics 563.) F
564 Practicum in Human Development or Family Studies II (3) School and community programs. Education for human development and family living. Prereq: Consent of instructor. S/N only. E
565 Practicum in Human Development or Family Studies III (3) School and community programs concerned with education for human development and family living. Prereq: Consent of instructor, S/N only. E
566 Approaches to Family Intervention and Counseling (3) Various theoretical approaches for family intervention and counseling. Structural, strategic, experiential and social learning schools of practice. Effects of intervention from perspective of their impact on family functions and communication. Prereq: (Same as Educational and Counseling Psychology 566.) Sp, A
571 Research Seminar (1) Presentation and critique of research projects. Prereq: Departmental major or consent of instructor. May be repeated. S/N only. E
574 Analysis of Teaching for Professional Development (2) (Same as Education 574.)
575 Professional Internship in Teaching (1-8) (Same as Education 575.)
580 Special Topics in Human Development or Family Studies (1-3) Research, theses, and research in child development or family studies; divorce, handicapped children, symbolic interaction, work and family, Piaget, mainstreaming children, theory and research in human sexuality, cognition. Prereq: 5 graduate hrs in major, or consent of instructor. May be repeated with different topics. Maximum 9 hrs. E
581 Directed Study in Human Development or Family Studies (1-3) Individual learning experiences in specific topics in child development or family studies. Prereq: Graduate hrs or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E
590 Assessment of Development and Learning in Young Children (3) Theory, empirical research and practices related to measurement of development and learning in young children. F, A
591 Clinical Studies (4) (Same as Education 591.)
600 Doctoral Research and Dissertation (3-15) P/NP only. E
610 Advanced Special Topics in Human Development or Family Studies (1-3) Study of research and theory related to current issues. Prereq: 12 graduate hrs in major or consent of instructor. May be repeated with different topics. Maximum 6 hrs. E
620 Advanced Directed Study in Human Development or Family Studies (1-3) Advanced, in-depth individualized learning experiences in specific topics in child development or family studies. May be repeated with different topics. Maximum 6 hrs. E
630 Advanced Developmental Processes (3) Societal, cognitive, emotional, and affective language development during infancy and childhood. Prereq: 510 or equivalent or consent of instructor. E
631 Adolescent Development in Families (3) Normative and nonnormative adolescent development: physical, cognitive, moral, social, familial, sexual, and personal adjustment. Prereq: 510 or equivalent or consent of instructor. F
632 Advanced Study in Family Interaction (3) Human communication and conflict management within family context. Prereq: 12 graduate hrs in major or consent of instructor. S/N only. S, A
633 Survey and Analysis of Family Behavior (3) Analysis of methods and measures used in family science research. Prereq: 550, 571, 3 hrs graduate statistics, or consent of instructor. S/N only. S, A

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**Civil and Environmental Engineering**

(College of Engineering)

**MAJORS**

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

**DEGREES**

Gregory D. Reed, Head

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

Associate Professors:
Alavain, V. (Adjunct), Ph.D. ............. Wisconsin
Bennett, R. M., Ph.D. .................. Illinois
Drum, E. C., Ph.D. .................. Arizona
Hansen, J. H., Ph.D. .................. Missouri
Hyftants, G. J. (Adjunct), Ph.D. ......... Vanderbilt
Miller, T. L., Ph.D. ................. Tennessee
Moore, A. B., M.S. .................. Tennessee
Nappo, C. J. (Adjunct), Ph.D. .......... Georgia Tech
Richards, S. H., Ph.D. ............... Tennessee
Smoot, J. L., Ph.D. ................. VPI
Tiry, R. F. (Emeritus), B.S. ........ Marquette

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

The Department of Civil and Environmental Engineering offers degrees leading to the Master of Science and Doctor of Philosophy with a major in Civil Engineering concentrating in construction engineering, environmental engineering, geotechnical/materials engineering, public works engineering, structural engineering, and transportation. To be admitted to the Master of Science in Environmental Engineering with concentrations in water quality, water resources, public works engineering, structural engineering, civil engineering, environmental engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

**The Master of Science Program**

The Master of Science in Civil Engineering and Environmental Engineering are offered to graduates of recognized undergraduate curricula. The 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. The Master of Science in Environmental Engineering with concentrations in water quality, water resources, public works engineering, structural engineering, civil engineering, environmental engineering offers both thesis and non-thesis options for work toward the Master of Science degree in Environmental Engineering.

**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 related to 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.
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 (concentration in air quality or waste management) is available to residents of the state of Alabama. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

**Civil Engineering**

**Graduate Courses**

406 Legal and Ethical Aspects of Engineering (2) Legal principles underlying engineering work; laws of contracts, torts, real property, and probate of professional registration and ethics. Prereq: Senior standing.
421 Portland Cement and Asphaltic Concrete (3) Aggregate properties and tests, tests of portland cement concrete, mix design methods for concrete and asphalt, concrete admixtures, tests of asphalt and asphalt mixes, and nondestructive testing. Prereq: 321, 2 hrs and 1 lab.
451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; application of various engineering principles and techniques to process of planning, designing, and highway facilities; both geometric and pavement design. Prereq: 210, 251, 352.
452 Traffic Engineering (3) Characteristics of driver, vehicle, and roadway and their interrelationship; traffic studies; basic considerations of traffic circulation and control, lighting, capacity analysis, roadway safety analysis, and design. Prereq: 210, 251, 352.
453 Airport/Railroad Planning and Design (3) Airport master planning and railroad engineering. Runway configuration, airfield capacity, terminal layout, and design. Railroad capacity, geometric 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 portal, frame, building frames, and space frames; matrix methods; use of computer in structural analysis. Prereq: Structural Analysis II.
472 Steel Design (3) Design of plate girders and composite beams; considerations for members subjected to combined stresses; design of typical framed building connections. Prereq: 471.
474 Reinforced Concrete Design (3) Reinforced concrete continuous beams and floor slabs, columns with combined axial loads and bending, footings and retaining walls. Prereq: 471.
485 Principles of Geohydrology (3) (Same as Geological Sciences 485.)
490 Water Resources Project Design (3) Coherent development of multipurpose reservoir and dam project, data acquisition, spillways, and outlet works design; earth 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 conveyance and control structures. Application of hydrologic and hydraulic principles to design of drainage systems for urban, strip mining, and highway development; design of inlet structures, ditches, culverts, and detention/retention basins; application of commonly-used computer runoff models; evaluation of land use on streamflow quantity and quality. Prereq: 390, 395.
495 Water Resources Development and Management (3) Principles of water resources project development, planning, and management. Institutional framework: water law, evaluation procedures for comparing and selecting among water resources development alternatives, multi-objective planning, principles of engineering economics, benefit-cost analysis, and cost allocation methods; environmental impact assessment procedures; analysis of water resources and their application. Prereq: Senior standing.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 Urban Systems: Engineering and Management (3) Various urban systems usually under responsibility of city manager and/or city engineer: streets, lighting, water, sewerage, refuse collection. Personnel management, finance, marketing and public relations. Prereq: 321 and 330.

530 Soil Stabilization (3) Mechanical stabilization of soils by compaction, drainage, and blending; stabilization of subgrades and foundations; waterproofing and modifying soils and additives. Reinforced earth and stabilization with geosynthetics. Prereq: Introduction to Soil Behavior.


538 Numerical Methods in Geotechnical Engineering (3) Applied to geotechnical engineering; beams on elastic foundation, nonlinear soil behavior, soil structure interaction. Application of finite element method to selected soil engineering problems, piles, retaining structures, and consolidation. Prereq: Foundations Engineer-
ing.

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.

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

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

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


551 Traffic Engineering—Characteristics (3) Univehicle—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/pacing; one-way reversible flow; system operations; identification of patient situations and accident locations and system deficiencies. Prereq: 551 or 452.

553 Geometric Design and Layout of Roadways and Community Facilities (3) Functional and geometric design and rural and urban roads of all classes. Subdivi-
sion layout; configuration of urban roads of all classes; techniques for access control; freeway interchanges and street systems; and parking. Prereq: 451 or consent of instructor.

554 Urban Transportation Planning (3) Transportation problems in urban area; systematic planning for identifying existing and future problems; travel surveys and demand mode; evaluation of transportation facilities; computer programs; transportation management; urban goods movement. Transportation system management. Prereq: 352 or graduate standing.

555 Public Transit Planning (3) Characteristics of transit systems—category and type, operational design of transit services; route planning and scheduling; cost analysis; mode choice models; performance evaluation; transit survey techniques, 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 microcomputers to analysis of transportation actions. Prereq: 551, 552.

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 land use factors; design of parking facilities; use of preferential processes to establish existing travel patterns, modeling of demand, proposing alternatives and evaluation. Prereq: Graduate standing. (Same as Planning 537.)

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

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

563 Statical Indeterminate Structures (3) Deflections of beams and trusses; force methods; moment distri-
bution and other displacement methods; secondary stresses. Prereq: 351.

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

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

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

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

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

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

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

575 Repair and Retrofitting of Structures (3) Tech-
niques, 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, Aviation Systems 588, Chemical Engineering 588, Electrical and Computer Engineering 588, Mechanical Engineering 588 and Aerospace Engineering 588.)

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

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

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

600 Doctoral Research and Dissertation (3-15) Prereq: Consent of faculty member. May be repeated. May be repeated.

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

639 Soil Dynamics (3) Behavior of soils and soil-structure systems under time dependent loading; wave propagation in elastic media; principles of seismic reflection techniques; effects of earthquakes and vibratory machines on soils and foundations; dynamic and cyclic soil testing; determination of soil properties. Use of preying process to establish existing travel patterns, modeling of demand, proposing alternatives and evaluation. Prereq: 530 and 565 or Engineering Sciences and Mechanics 431.

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

652 Analysis Techniques for Transportation Sys-
tems II (3) Advanced topics of application of mathemati-
cal, statistical, and computer science techniques to modeling and analysis of transportation systems. Prereq: 651.

666 Advanced Structural Reliability (3) Monte Carlo methods; structural system reliability; random processes; dynamic loads on structures. Prereq: 566.

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

674 Behavior of Reinforced Concrete Beams and Slabs (3) Strength and behavior of statically indeter-
minate reinforced concrete beams and slabs; limit analysis; behavior, analysis, and design of reinforced concrete members subjected to static and dynamic loads. Prereq: 574.

689 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) Prereq: Consent of faculty member. May be repeated. May be repeated.

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

508 Seminar (1) Reports on current research in environ-
mental engineering at UTK. Prereq: Graduate standing. May be repeated.

510 Environmental Protection (3) Managing of water resources, wastewater, air quality, solid wastes, and hazardous materials to promote efficiency and comfort.
520 Open Channel Hydraulics (3) Open channel flow principles, properties, and classifications; uniform and gradually varied flow theory and applications; open channel design; unsteady flow theory and analysis; dynamic routing; spatially varied flow; non-linear alignment; microcomputer applications; featuring HEC-2 model. Prereq: Civil Engineering 390.

522 Floodplain and Urban Flood Management (3) Review of national, regional, and local flood problems; state of the art flood damage reduction alternatives: structural and non-structural; Institutional responses; policies, programs, organizations, regulations, and legal aspects; floodplain hydrology and hydraulics; HEC-1, HEC-2; floodway encroachment, flood hazard zone and damage potential determinations; case studies. Prereq: Civil Engineering 390 or consent of instructor for non-majors.

524 Sediment Transport (3) Sediment properties and measurements; principles of dynamics of suspended and bed sediment transport in erodible channels; erosion, transportation, and deposition of sediment by flowing water, erodible channel design; channel regime theory; common computer models. Prereq: Civil Engineering 395.


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

540 Remote Sensing for Transportation and Facilities Siting (3) Principles of remote sensing; sources of data and data acquisition systems; photo interpretation, analog and digital techniques for analysis of aerial and terrestrial photos, radar and thermal imagery with application to transportation and facilities planning; construction and control. Prereq: Consent of instructor. 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 to treatment of wastewater and solid wastes. Prereq: Civil Engineering 380. 2 hrs and 1 lab.

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

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

555 Solid Waste Management (3) Magnitude and characteristics of municipal 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 sound, meteorology, effects; stack sampling; emission control systems. Prereq: Consent of instructor.

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

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

573 Sampling of Air Pollutants (3) Standard sampling methods for particulate and gaseous air pollutant emissions from industrial processes; ambient air monitoring instrumentation/techniques. Prereq: 570.

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

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

605 Advanced Water Quality (3) Advanced topics in water quality including aquatic ecosystems; water supply and treatment; water quality management; water quality regulations. Prereq: Consent of instructor.

615 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 553, Prereq or coreq: 552. 2 hrs and 1 lab.

620 Advanced Water Quality (3) Advanced topics in water quality including aquatic ecosystems; water supply and treatment; water quality management; water quality regulations. Prereq: Consent of instructor.

651 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 553, Prereq or coreq: 552. 2 hrs and 1 lab.


653 Pollutant Fate Modeling and Risk Assessment (3) Application of scientific principles concerning movement and fate of contaminants in air, water, and earth systems in environmental and academic profession on both high school and college levels. Prereq: Consent of instructor.

654 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 553, Prereq or coreq: 552. 2 hrs and 1 lab.

655 Industrial Waste Unit Operations and Processes (3) Theoretical design and laboratory modeling of industrial waste treatment processes and operations. Prereq: 551, 553, Prereq or coreq: 552. 2 hrs and 1 lab.


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

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

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


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: 391-392 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: 391-392 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 6 hrs.

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

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

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

541-42 The Latin Epic: Lucretius, Vergil (3,3) Advanced study of epic masterpieces of Lucretius and Vergil; both Georgics and Aeneid of Vergil.

561 Special Topics in Classical Civilization (1-3) Advanced tutorial work in Greek and Roman authors in English translation; problems in cultures of Greece and Rome. May be repeated. Maximum 9 hrs. Letter grade or S/NC.

562 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian, and African prehistory. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Anthropology 562.)

The Classics (College of Liberal Arts)

Susan D. Martin, Head

Professors:

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

Associate Professors:

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

(College of Communications)

MAJOR DEGREES

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

Professors:
Ashdown, Paul G., Ph.D. ................................ Bowling Green
Crook, James A., Ph.D. ................................ Iowa State
Everette, George A., Ph.D. ................................ Iowa
Howard, Herbert H. (Liaison), Ph.D. ............ Ohio
Littmann, Mark Ph.D. ................................ Northwestern
Miller, M. Mark, Ph.D. ................................ Michigan State
Singletary, Michael W., Ph.D. .................. Southern Illinois
Swan, Norman R., Ph.D. ............................... Missouri
Taylor, Ronald E., Ph.D. ................................. Illinois

Associate Professors:
Bowles, Dorothy, Ph.D. ................................. Wisconsin
Caudill, C. Edward, Ph.D. .......................... North Carolina
Hovland, Roxanne, Ph.D. ........................... Illinois
Moore, Barbara A., Ph.D. .............................. Ohio
Stankey, Michael J., Ph.D. ............................. Illinois
Ziegler, Diyanha, Ph.D. ................................. Southern Illinois

Assistant Professors:
Buchman, Joseph, Ph.D. ............................... Indiana
Hoy, Marica, Ph.D. ........................................ Oklahoma State
Lucarelli, Susan M., Ph.D. ....................... Tennessee

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 Master'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 candidate status normally include a 3.0 (4.0 system) grade-point average in undergraduate studies and scores above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination. All application materials are screened by 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 some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program is available to residents of Arkansas, Kentucky (concentration in advertising), or Louisiana. The Ph.D. program in Communications is available to residents of the states of Alabama, Arkansas, Louisiana, Maryland, 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 grade-point average, not including incomplete grades, is below 3.0 at any time after the end of 12 hours of graduate credit will be placed on probation. A student on probation will be dropped from the program unless his or her cumulative grade-point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 semester hours of graduate coursework attempted that is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Studies of the College of Communications on the recommendation of the student's faculty committee.

THE MASTER'S PROGRAM

The Master of Science with a major in Communications is intended for students who desire a career in the mass media with an emphasis on communications management and a deeper understanding of the communication process and social role of the mass media. The program follows a broad-based multi-media approach while allowing the student to concentrate in one of four fields: advertising, broadcasting, journalism, or public relations. 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 corequisite coursework and research for the thesis option, with a final grade of at least B in each course. The student must pass an oral examination conducted by his/her graduate committee. The non-thesis option requires a written comprehensive examination and an oral defense of the project.

THE DOCTORAL PROGRAM

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

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

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

The following are normally minimal requirements for admission to full potential candidate status:

1. A 3.0 (4.0 system) grade-point average in undergraduate studies, or 3.5 for graduate work if applicant holds a Master's degree;
2. A statement of the applicant's goals and reasons for pursuing the doctorate. Personal interviews with members of the Ph.D. Admissions Committee are recommended and may be required. Professional experience in some field
of communications is a highly desirable criterion for admission. A minimum of 88 hours of approved graduate work is required for the Ph.D.

1. Twenty-eight hours of core courses: Communications 610, 612, 620, 640, 641; 6 hours of statistics; and three of the following courses: Communications 622, 632, 642, 652, and 692.

2. Fifteen hours in a primary concentration (advertising, broadcasting, journalism, public relations, or speech communications).

3. Twelve hours in a secondary concentration (outside the College of Communications).


5. Twenty-four hours of dissertation.

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

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

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

Candidates without prior teaching experience must register for Communications 521, Tutorial in Communications Teaching. Planned course offerings in the College of Communications for a full calendar year are published prior to November. This information is available from the Dean’s Office, 302 Communications Building, 974-3031. See also courses listed under Advertising, Broadcasting, and Journalism.

**GRADUATE COURSES**

400 Mass Communications Law and Ethics (3) Legal issues directly affecting the mass media: libel, privacy, free press-fair trial, judicial controls, governmental regulations. Ethical standards and practices of mass media. Prereq: Consent of instructor. F

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

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

510 Orientation to Master's Studies (1) Degree and thesis requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NC only. F

512 Fundamentals of Media Research (3) Applications of research techniques to management. Gathering and analysis of data for assessing media audiences and message impacts. Prereq: Consent of instructor or admission to program. S/NC only. F

531 Tutorial in Communications Teaching (1) Experience as teacher under guidance of faculty member. Prereq: Consent of instructor. S/NC only. E

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

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

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

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

592 Seminar in Mass Communications Issues (3) Contemporary topics in communications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

597 Independent Study (3) Reading, research or projects on special topics in communication. On individual basis, under faculty supervision. Consent may be required. Maximum 6 hrs. E

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

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

612 Fundamentals of Communications Research (3) Universal research process from defining ideas and problems to reporting results. Causal inference and relative strengths of various research designs. Fundamentals and specific applications of most common data-gathering and measurement techniques in communications research: experiments, survey, content analysis, historical and quantitative. Prereq: Consent of instructor or admission to program. S/NC only. F

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

622 Quantitative Research (3) Techniques for evaluation of research design and measurement. Survey, content analysis, and experimental techniques. Assessment of reliability and validity. Data analysis, hypothesis testing, and inference strategies. Prereq: 612. F

632 Mass Communications History and Historiography (3) Origins and development of mass media in America. Philosophies of history. Historical sources and their verifications. Synthesis and interpretation of data. Prereq: 612 or consent of instructor. S/NC only. F

640 Mass Communications Theory I (3) Selected research hypotheses, and theories in literature of mass communications theory. Prereq: Consent of instructor or admission to program. S/NC only. F

641 Mass Communications Theory II (3) Selected topics in theory. Critical evaluation of extent theory, derivation of hypotheses, and advanced theory construction. Prereq: 640. S/NC only. F

642 Qualitative Research (3) Theory and application of quantitative research methods to social science and communications research. Theoretical considerations underpinning symbolic interactionism as translated into research strategies. Prereq: 612 or consent of instructor. S/NC only. F

652 Mass Communications Law and Legal Research (3) Legal restrictions under which mass media operate. Finding, interpreting, and analyzing sources of legal information. Prereq: 612 or consent of instructor. S/NC only. F

692 Advanced Topics in Communications Theory and Methodology (3) Advanced study of communication issues, theories and methods. May use qualitative, quantitative, and interpretive research methods. Prereq: Consent of instructor. S/NC only. F

750 Seminar in Mass Communications Law and Ethics (3) Legal issues directly affecting the mass media: libel, privacy, free press-fair trial, judicial controls, governmental regulations. Ethical standards and practices of mass media. Prereq: Consent of instructor. F

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

790 Project (3) Capstone project under guidance of faculty. Application of principles from previous coursework. S/NC only.

792 Seminar in Mass Communications Issues (3) Contemporary topics in communications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

797 Independent Study (3) Reading, research or projects on special topics in communication. On individual basis, under faculty supervision. Consent may be required. Maximum 6 hrs. E

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

710 Orientation to Doctoral Research (1) Degree and dissertation requirements. Committee formation and program planning. Overview of research methods and informational sources. Prereq: Consent of instructor or admission to program. S/NC only. F

712 Fundamentals of Communications Research (3) Universal research process from defining ideas and problems to reporting results. Causal inference and relative strengths of various research designs. Fundamentals and specific applications of most common data-gathering and measurement techniques in communications research: experiments, survey, content analysis, historical and quantitative. Prereq: Consent of instructor or admission to program. S/NC only. F

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

722 Quantitative Research (3) Techniques for evaluation of research design and measurement. Survey, content analysis, and experimental techniques. Assessment of reliability and validity. Data analysis, hypothesis testing, and inference strategies. Prereq: 612. F

732 Mass Communications History and Historiography (3) Origins and development of mass media in America. Philosophies of history. Historical sources and their verifications. Synthesis and interpretation of data. Prereq: 612 or consent of instructor. S/NC only. F

740 Mass Communications Theory I (3) Selected research hypotheses, and theories in literature of mass communications theory. Prereq: Consent of instructor or admission to program. S/NC only. F

741 Mass Communications Theory II (3) Selected topics in theory. Critical evaluation of extent theory, derivation of hypotheses, and advanced theory construction. Prereq: 640. S/NC only. F

742 Qualitative Research (3) Theory and application of quantitative research methods to social science and communications research. Theoretical considerations underpinning symbolic interactionism as translated into research strategies. Prereq: 612 or consent of instructor. S/NC only. F

752 Mass Communications Law and Legal Research (3) Legal restrictions under which mass media operate. Finding, interpreting, and analyzing sources of legal information. Prereq: 612 or consent of instructor. S/NC only. F

792 Advanced Topics in Communications Theory and Methodology (3) Advanced study of communication issues, theories and methods. May use qualitative, quantitative, and interpretive research methods. Prereq: Consent of instructor. S/NC only. F

Comparative and Experimental Medicine

(Office of the Vice Chancellor for Academic Affairs)

MAJOR

DEGREES

Comparative and Experimental Medicine ............. M.S., Ph.D.

L. N. D. Potgieter, Director

Joint Graduate Coordinating Committee:

Fuhr, J. E., Ph.D., Medical Biology
Lawler, J. E., Ph.D., Psychology
Lozzio, C. M., M.D., Medical Biology
Potgieter, L. N. D. (Liaison), Ph.D., Veterinary Teaching Hospital
Sims, M. H., Ph.D., Veterinary Teaching Hospital

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

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

ADMISSION REQUIREMENTS

General Requirements

Admission requirements of The Graduate School of UT Knoxville apply. In addition, all applicants must furnish three letters of recommendation from individuals who are familiar with their scholastic or professional records.

Requirements for Admission to the Master of Science Degree Program

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

Applicants for admission to the Master of Science degree program whose background include no formal training in the biomedical field beyond the baccalaureate degree will be required to score at least 1,000 on the quantitative and verbal portions of the Graduate Record Examination.

Requirements for Admission to the Doctor of Philosophy Program
Applicants generally will be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences, (e.g., M.D., D.D.S., D.V.M.). An individual having a baccalaureate degree with 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 electives in the veterinary program.

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

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

Computer Science
(Chair, Liberal Arts)

MAJOR

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

Jesse H. Poore, Head

Professors:

Booth, Heather D., Ph.D. ............... Princeton
Gregor, Jens, Ph.D. .............. Aalborg (Denmark)
Mehta, Dinesh (UTS), Ph.D. ....... Florida
Mitchel, David C., Ph.D. ........... Duke
Plank, James S., Ph.D. ............. Princeton
Straitly, David W., Ph.D. ............ Texas
Vander Zanden, Bradley, Ph.D. ....... Cornell
Vose, Michael D., Ph.D. .......... Texas

Instructor:

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

THE MASTER'S PROGRAM

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

Computer Science 530, 560 and 580 are required for the degree. Graduate courses taken outside the department are sometimes allowed but must be approved by the Graduate Committee before enrollment.

Thesis Option

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

Non-Thesis Option

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

Master's Minor in Computer Science

The graduate minor consists of 511 or its equivalent plus an additional 6 hours of computer science graduate level courses at or above the 400 level.

THE DOCTORAL PROGRAM

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

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

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

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

Original research reported in a dissertation of high quality is emphasized. The minimum hour requirements are 24 hours of course 600

Doctoral Research and Dissertation and 24 hours of graduate courses beyond the equivalent of a master's degree (i.e., beyond 30 graduate credit hours) graded A-F. Computer Science 530, 560 and 580 are required for the degree. At least six hours of 600-level graded courses must be taken in computer science at UT 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.

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.

GRADUATE COURSES

420 Advanced Topics in Machine Intelligence (3) Search, constraint satisfaction, artificial intelligence, pattern recognition and natural language processing. Faculty research. Prerequisite: Completion of core curriculum or consent of instructor. May be repeated. Maximum 9 hrs.

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

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

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

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

472 Numerical Analysis (3) (Same as Mathematics 472)

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

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

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

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

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

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

523 Machine Learning (3) Algorithms whereby computers exhibit aspects of learning or inference about their environment. Supervised and unsupervised methods; data-driven pattern analysis; expert and simplified structure. Prerequisite: S21.

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

530 Computer Systems Organization (3) Architecture and system organization for small and large computers. Prerequisite: Discrete Structures and System Programming.

532 Boolean Algebra, Logic Design and Microprocessors (3) Boolean algebras, combinational and sequential logic design, microprocessors, hardware lab. Prerequisite: One year of college mathematics beyond algebra and trigonometry.

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


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

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


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

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

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

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

576 Sparse Matrix Computations (3) Solution of large sparse linear systems; graph models; compact techniques, symbolic factorizations, data structures, numerical algorithms, complexity analyses, parallel algorithms. Prereq: Numerical linear algebra.

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

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

586 Computability and Computational Complexity (3) Computability by abstract devices, recursively enumerable sets, decidability, NP-completeness, polynomial-time hierarchy. Prereq: 580.

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

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

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

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

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

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

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

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

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

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

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

Curriculum and Instruction

(College of Education)

MAJOR DEGREES

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

J. Estill Alexander, Head

Professors:

Alexander, J. Estill (Liaison), Ed.D.... Kentucky
Allison, C. B., Ph.D............ Oklahoma
Bellon, Jerry J., Ed.D............ California
Blank, Kermit J., Ph.D......... Ohio State
Burfish, 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
Doak, E., Dale, Ed.D.......... Colorado
Frandsen, Henry, Ph.D...... Illinois
French, R. L., Ph.D........... Ohio State
Hipple, Theodore W., Ph.D.... Illinois
Huff, P., Ph.D................. Ohio State
Hull, H. N., Ed.S.............. Peabody
Iost, Karl J., Ed.D............. Oklahoma
Knight, Lester N., Ph.D..... Texas
Mallik, Anand, Ed.D.......... Columbia
Mays, N., Ph.D............. Southern Illinois
McIntyre, Lonnie B., Ed.D.... Indiana
Myer, M. E., Ph.D............ Florida
Ray, John R., Ed.D............. Tennessee
Roeseke, C. E., Ph.D........ Ohio State
Rowell, C. Glennon, Ed.D..... George Peabody
Turner, T., Ed.D.............. Penn State
Wisniewski, Richard, Ed.D.... Wayne State

Associate Professors:

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

Assistant Professors:

Bardon, Laura M., Ph.D....... Maryland
Hendricks, D. A., Ph.D..... Alabama

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

THE MASTER'S PROGRAM

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

Track 1 - Concentrations are available in art education, curriculum and instruction, education leadership, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, social foundations, and social science education. The non-thesis option requires the completion of 30 hours of coursework. The thesis option requires the completion of 30 hours, including 6 hours of Thesis 500.

Specific requirements for the concentration in art education are: For the thesis option, Art Education 510, 520, and 593; 3 hours of 500-level elective courses in art history; 3 hours of 400- or 500-level elective courses in studio art; C & I 517, 520; 3 hours selected from C & I 511, 526, 542, 543, 544, 535, 558, 569, or 588 and 6 hours of Art Education 500. The non-thesis option requires Art Education 510, 520, 593 and 590; 3 hours of 500-level elective courses in art history; 6 hours of 400- or 500-level elective courses in studio art; C & I 517, 560; 3 hours selected from C & I 511, 526, 542, 543, 544 and 3 hours selected from 535, 558, 569 or 588. The non-thesis option culminates in an exhibition of original works of art produced under the direction of art and art education faculty, accompanied by a written analytical and critical essay. This essay must include a philosophical statement, an explanation of process and media for each work presented, and a compositional analysis of each work.

Track 2 - Concentrations are available in art education, elementary teaching and in secondary teaching. For art education, the non-thesis requirements are Art Education 510, 520, 530, and 540; Education 574, 575, 591; C & I 517 and 3 hours selected from C & I 511, 526, 542, 543, 544, 535, 558, 569 or 588 for a total of 36 semester hours. For elementary or secondary teaching, the non-thesis requirements are Education 574 and 591, 6 hours; Internship, 12 hours; speciality methods, 6 hours; and 12 hours of electives as approved by the student's committee, for a total of 36 hours.

The thesis option for all concentrations requires 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.

THE SPECIALIST PROGRAM

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

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

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

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program (concentration in foreign language education only) in Curriculum and Instruction is available to residents of the state of Louisiana. The Ed.D. program (concentration in education only) in Curriculum and Instructor 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.

Art Education

GRADUATE COURSES

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

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

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

520 Studies in Art Education (3) Current practices and procedures in art education: content, curriculum, and teaching methods. Prereq: Consent of instructor.

530 Production and Critical Analysis of Art (3) Response of production and critical analysis of works of art to discipline-based art education.

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 packets.

590 Special Topics in Art Education (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

593 Independent Study in Art Education (3-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

Curriculum and Instruction

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 science and/or 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; content and curricula overview. Unit planning, daily planning, evaluation, etc., and language and concept development.

429 Language Arts Reading Instruction in Elementary and Middle School (3) Language and language development as applied to teaching of oracy (listening-speaking) and aspects of literacy (reading-process/readiness and writing-process). 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 elementary school mathematics. Cannot apply toward M.S. degree. Prereq: Admission to teacher education. F, Sp


451 Education in Cultural Perspective (3) Contributions of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and thought in our society and others.

454 Teaching Strategies and Issues in Social Studies Education (3) Goals, objectives, techniques, materials, 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 reading skills and ways of teaching literature. Sp

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

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

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

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

496 Teaching Science Grades 7-12 (3) Methods, materials, recent trends in science and environmental education 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 the student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 6 hrs. S/NC only. E


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

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

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

508 Teaching Composition in the Secondary School (3) Teaching narration, description, exposition, and argumentation; writing process and marking of student papers.

509 Teaching Fiction in the Secondary School (3) Teaching novels and short stories.


515 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E

516 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E

517 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC or letter grade. E

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

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

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

521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in curriculum, development of content, and generalizations; integration of social sciences. Prereq: Course in teaching of social studies or consent of instructor.

522 Teaching Mathematics in Elementary and Middle Schools (3) Instructional strategies for helping elementary school children learn mathematics. Examination, development and use of materials for creating active learning environment. Prereq: 443 or equivalent or consent of instructor. F, Su

523 Diagnosis and Correction of Children's Difficulties in Learning Mathematics (3) Children's difficulties in learning mathematics and procedures for helping classroom teacher correct difficulties. Prereq: 522 or equivalent or consent of instructor. 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 ele-
mentary school. Trends and issues which affect elementary education. Prereq: Consent of instructor. F, Su

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

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

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

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

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

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

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

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

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

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

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

540 Topics in Improvement of Instruction (1-3) Special conferences, workshops, and in-service programs. May be repeated. Maximum 12 hrs. Sp, Su

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

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

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

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

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

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

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

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

550 Assessment and Correction of Language Arts Difficulties (2) Recent trends and methods 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 planning for developmental readers. Prereq: Consent of instructor. F

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

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

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

561 Educational Statistics (3) Applications of descriptive and inferential statistics to educational and instructional problems. Use of electronic calculators in educational research. Prereq: 1301, or consent of department. E

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

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

565 Instructional Trends and Issues in Science Education (3) Analysis of current trends in science instruction. Educational, professional, and community college science teachers, and application of learning theory to teaching biological, physical, and environmental sciences. Prereqs: 496, 422, or equivalent.

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

567 Application of Theory in Early Childhood Education (K-3) (3) Principles and practices from selected theoretical orientations. Prereq: Course in early childhood education or consent of instructor. May be repeated. Maximum 6 hrs. F, Su

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

569 Advanced Production of Audiovisual Software (3) Hand and mechanical lettering, flat picture mounting, laminating, overhead projection, audio production, TV studio orientation, sync-taping, multi-screen presentations, editing and mini-movie production. Some as Library and Information Science 559. Sp, Su

570 Utilization of Educational Television and Radio (3) Television and radio as instructional and training media. Selecting, making and evaluating instructional/training video and audio products. Prereq: Consent of instructor. F, Su

571 Introduction To Data Processing in Curriculum and Instruction (3) Analysis of current activities in educational computing and data processing. Curricular, instructional, and research areas of application and relationships to other areas of educational inquiry. Critical reading of research and development of skills needed for proposal development. E

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

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


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


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

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

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

648 Topics in Sociology of Education (3) May be repeated. Sp

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

651 Advanced Studies in Elementary School Language Arts (3) Selected issues in elementary school language arts. Prereq: Graduate course in elementary school language arts 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. Su

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) Evaluation trends and issues. Theoretical frameworks to design evaluation studies for various educational programs. Sp

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

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

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

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

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

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

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

696 Research Trends in Science Education (3) Analysis of current research trends in science education and relationship of such trends within broader educational community. Prereq: 628.
THE DOCTORAL PROGRAM

The requirements for this degree are in general the same as those of The Graduate School. This doctoral program must include Ecology 573, 574, and 610 as designated, or an approved equivalent course, and an approved list of quantitative methods offerings. A student cannot enroll for dissertation hours until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

ADVISORS

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

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when the student uses University facilities and/or faculty time before degree is completed. May be repeated as needed. S/N C only. E
510 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 6 hrs.
520 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. 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.
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.
573 Population Biology (3) Same as Zoology 573 and Botany 573.
574 Communities and Ecosystems (3) Patterns underlying principles of 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.
635 Environmental Assessment and Sustainable Development in Third World Countries (3) Concepts and methods of environmental impact assessment and risk assessment. Sustainable development concepts and issues in developing countries. The role of risk and impact assessment in achieving sustainable development. Prereq: General ecology or equivalent. (Same as Botany and Planning 635.)

Economics

(College of Business Administration)

MAJORS

DEGREES

Economics ........................................ M.A., Ph.D.
Business Administration ............................ MBA

William F. Fox, Head

Professors:

Bohm, Robert A. (Liaison), Ph.D ................................ Washington (St. Louis)
Bowiey, Roger L., Ph.D .................................. Texas
Carroll, Sidney L., Ph.D .................................. Harvard
Chang, Hui S., Ph.D ....................................... Vanderbilt
Clark, Don P., Ph.D ....................................... Michigan State
Cole, William E., Ph.D .................................... Texas
Davidson, John A. (Chair), Ph.D ......................... Pennsylvania
Feiwel, George R. (Emeritus), Ph.D ....................... McGill
Fox, William F., Ph.D ..................................... Ohio State
Garrison, Charles B., Ph.D ................................. Kentucky
Herzog, Henry W., Ph.D .................................. Maryland
Jensen, Hans E. (Emeritus), Ph.D ......................... Texas
Lee, Feng-Yao, Ph.D ..................................... Michigan State
Mayhew, Anne, Ph.D ..................................... Texas
Moore, John R. (Distinguished Prof.) (Emeritus), Ph.D ................... Cornell
Neal, William G., Ph.D .................................... London
Quindry, K. E. (Emeritus), Ph.D ........................... Kentuck
Russell, Milton, Ph.D ..................................... Oklahoma
Schlottman, Alan M., Ph.D ................................. Washington (St. Louis)
Spiva, George A., Ph.D ..................................... Texas

Associate Professors:

Gauger, Jean A., Ph.D .................................... Iowa State
Glustoff, Errol, Ph.D ..................................... Stanford
Kahn, James R., Ph.D ..................................... Maryland
Mandy, David M., Ph.D ..................................... Illinois
Mayo, John W., Ph.D ..................................... Washington (St. Louis)
Murray, M. N., Ph.D ..................................... Syracuse
Phillips, Keith E., Ph.D ..................................... Washington

The Department of Economics offers graduate programs leading to the M.A. and Ph.D. The M.A. may be completed by either a thesis or non-thesis option, while the Ph.D. requires successful completion of a dissertation. Applicants to these programs should contact the Director of Graduate Studies, Department of Economics, for further information. The Department also offers an area of concentration...
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 as approved by the area MBA faculty advisor.

GRADUATE COURSES

400 Special Topics (3) Topics vary. Prereq: Determined by department. May be repeated.

413 Macroeconomic Fluctuations (3) Analysis of historical data, methods of analyzing macro-economic fluctuations, theoretical explanations of cycles, and role of monetary and fiscal policies in aggregate economy. Major writing requirement. Prereq: Intermediate Macroeconomics or consent of instructor.


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, economics of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. Prereq: 201.

451-12 Microeconomic Theory (3,3) Theory of consumer, producer, and factor pricing, and market structures, derived demand and factor pricing, uncertainty, theory of firm, theory of production and cost, market structures, derived demand and factor pricing, introduction to welfare economics, market failure and theory of second best, pure exchange.

513-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, non-market-clearing, monetarist, and rational expectations paradigms.

515 History of Economics (3) Purpose and methods of historical study of economics. Background for and origins, concerns, methods, development and conclusions of classical, neoclassical and modern economists. Prereq: 201.

525 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of Western civilization. Major issues of method and interpretation. Prereq: Graduate standing in economics or consent of instructor.

526 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. Prereq: Graduate standing in economics or consent of instructor.

562 Labor Relations and Collective Bargaining (3) (Same as Management 522.)


600 Doctoral Research and Dissertation (3-15) P/NP only. Prereq: 615.

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

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


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

624 Economic Development: Western Impact on Asia and Africa (3) Studies of consequences of contact between developed world and developing countries of Asia and Africa. Prereq: 21 hrs of upper division undergraduate social science or consent of instructor.
Education

82

631-32 Industrial Organization and Public Policy
(3,3) Organization of industry in modern mixed enter-
prise economy. Problems of monopoly and competition.
Antitrust and direct regulation. Prereq: Consent of in-
structor.

641 Labor Economics (3) Theory of labor markets and
wage determination under competitive conditions. Labor
markets under conditions which interfere with competi-
tion, unions and discrimination. Human capital and esti-
imation of returns to schooling. Topics vary. Prereq: 311
and 313, or equivalent.

642 Labor History and Legislation (3) Development of
organized labor as important economic and political
force in U.S., from Colonial times to present. Evolution
of legal status of labor unions and of individual workers vis-
a-vis their employers.

651 Monetary Theory (3) Study of money, credit, and
liquidity as related to real output determination, interest
rates, employment, and prices. Prereq: 513.

652 Topics in Monetary Theory (3) Advanced moneta-
ry models, issues in monetary policy, open economy
monetary theory and policy. Student participation. Pre-
req: 515.

661 Regional and Urban Location and Development
Theory (3) Theory of industrial and agricultural location
and human migration. Economic basis for land-use pat-
terns, central places, and urban form. Spatial inequities
and urban problems. National policies for regional and
urban assistance.

662 Methods of Regional and Urban Analysis (3)
Theory of regional economic structure and growth.
Regional income and product accounts, shift and share
analysis, economic base studies, and regional/urban
input-output models. Theory and problem solution.

671 Public Finance: Optimal Government Size and
Expenditure Analysis (3) Theory of public goods and
externalitys; public choice. Expenditure incidence and
determinants; benefit cost analysis.

672 Public Finance: Taxation and Intergovernmental
Relations (3) Theory of taxation; tax incidence and tax
efficiency; policy analysis of U.S. tax structure of federal,
state, and local levels. Theory of fiscal federalism and
intergovernmental relations.

677 Environmental and Natural Resource Econom-
ic (3) Alternative paradigms for allocating and valuing
environmental resources. Exploration of issues related
to market failure and differences between renewable and
nonrenewable resources.

678 Economics of Environmental Policy (3) Topics in
environmental policy analysis. Consideration of alterna-
tive policy instruments, defining policy objectives and
role of risk in decision-making process.

681-82 Econometric Methods (3,3) Theory and tech-
niques of statistical testing of economic hypotheses and
construction and estimation of econometric models.
Review of classical least squares regression model, and
approaches to simultaneous equation models with appli-
cation to current econometric research. Prereq: 582 or
equivalent.

690 Workshop (3) Advanced topics in economics. Stu-
dent participation. Prereq: Consent of instructor. May be
repeated. Maximum 9 hrs.

Course requirements for the M.S. program include:

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<th>Fall Semester</th>
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<tr>
<td>Internship</td>
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<td>Specialty Studies</td>
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<td>Analysis of Teaching for Professional Development</td>
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<th>Spring Semester</th>
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<td>Internship</td>
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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 Curriculum and Instruction; Educational Leadership; Educational and Counseling Psychology; Health, Leisure, and Safety; Human Performance and Sport Studies; Special Services Education; and Technological and Adult Education.

The program requirements, concentrations and specializations are:

- **Requirements**
  - Minimum Hours
    - Research Area | 4 hrs
    - Foreign or Computer Language (demonstrate proficiency) | 6 hrs
    - General Core Requirements
      - History and philosophy of education, (both areas must be represented) | 4 hrs
      - Learning theory and curriculum (both areas must be represented) | 4 hrs
      - Administrative theory | 2 hrs
      - Trans-college seminar: three consecutive semesters (including summer) | 3 hrs
    - Alternative Core Requirements
      - Courses in philosophy of science | 3 hrs
      - Trans-college Seminar: three consecutive semesters (including summer) | 3 hrs
      - Seminar in area of specialization | 3 hrs
      - Courses in learning theory/group or independent study | 3 hrs
    - Concentrations
      - Primary Concentration: A minimum of 16 hours normally selected from one or two specializations within the primary concentration | 16 hrs
      - Supporting Specialization: A minimum of 9 hours selected from a specialization in a concentration other than the primary concentration | 9 hrs
    - Cognate
      - A minimum of 6 hours selected from outside the college in addition to the designated research courses | 6 hrs
    - Dissertation | 24 hrs

**CONCENTRATIONS**

**Administrative Theory and Practice**

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

**Theories of Curriculum Development and Foundations of Education**

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

**Instructional Theory and Practice**

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

**Theories and Practice of Educational and Personal Adjustment**

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

**Foundations of Human Movement**

- Specializations:
  1. Exercise Science:
    - Adapted Physical Education
    - Exercise Physiology/Fitness
  2. Motor Behavior:
    - Motor Control
    - Motor Learning
  3. Psychology of Sport
  4. Socio-Cultural Foundations of Sport:
    - History
    - Philosophy
    - Sociology

**Health Education**

- Specializations:
  1. Public health
  2. Safety

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Education is available to residents of the states of Arkansas (concentration in administrative theory and practice only) or South Carolina (concentration in theories and practice of educational and personal adjustment only). Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.
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 elementary guidance, secondary guidance, and school counseling; Educational Specialist with a major in Educational Psychology and Guidance, concentrations in educational psychology, school psychology, and school counseling; and Doctor of Education with a major in Educational Psychology, concentrations in school counseling 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 counseling are accredited by the Council for Accreditation of Counseling and Related Educational Programs; counseling and school 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 Council for the National Register of Health Service Providers in Psychology.

The application deadline for admission varies by program area. The deadlines for all programs are listed in the department admissions application form. Some programs also review applications 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 department admissions application form and letters of recommendation. All programs include a thesis and non-thesis options. Requirements for a major in Educational Psychology, concentration in educational psychology, 36 credits in community counseling; and for a major in Guidance, 36 credits in community counseling. Programs in 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 department admissions application form and letters of recommendation. All programs include a 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 or school counseling, it is assumed that they have completed a Master's degree equivalent to the one offered at UT Knoxville. In this case, the minimum hours beyond the Master's required to complete the Ed.S. are: educational psychology, 24; school counseling, 22. The 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 specializes which specialization is desired (i.e., counseling psychology, counselor education, educational psychology, or school psychology). Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental applications form.

Departmental admissions requirements include up-to-date scores from the GRE, the department admissions application form, letters of recommendation, and a writing sample. The following minimum number of hours is required in each program: specialization counseling psychology - 98; counselor education, Ph.D., Ed.D. - 98; Ed.D. - 79; educational psychology, Ph.D. - 92, Ed.D. - 89; school psychology, Ph.D. - 97. Residency for the Ph.D. programs is three consecutive semesters of full-time coursework and two consecutive semesters for the Ed.D. The Ph.D. program requires coursework in both a supporting specialization and a cognate area, as well as either foreign language or computer proficiency. Coursework in statistics and research design is a requirement in all doctoral programs. Pre-dissertation research participation is a requirement in the Ph.D. program. The concentrations/specializations in counseling psychology, counselor education, and school psychology each require a year-long practicum sequence and the equivalent of a year's full-time work as an intern in an appropriate counseling setting. The concentrations/specializations in educational psychology and counselor education also require supervised practicum experience in classroom teaching. All doctoral students take written comprehensive examinations in the program concentration, supporting specialization and lateral areas. The guidelines for each program concentration may be consulted for further requirements.

MINOR IN GERONTOLOGY

Graduate students in the Department of Educational and Counseling Psychology may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ed.D. programs in Educational Psychology are available to
residents of the state of South Carolina. Additional information may be obtained from the 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 the development of person's sexual role and its relevance in educational and counseling settings. F, Su

431 Personality and Mental Health (3) Various perspectives of mental health with application to education and other social institutions. E

432 The Disadvantaged Student: Psychoeducational 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. Prereq: Introductory course in psychology or consent of instructor. S/NC or letter grade. Sp, Su

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

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

502 Registration for Use of Facilities (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 (1-3) May be repeated. Maximum 12 hrs. S/NC only. E

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

510 Psychological Theories of Human Development Applied to Education (3) Theory and research on emotional, intellectual, and social development over life span with applications to educational and therapeutic settings. F, Su

511 Cognitive Development: Implications for Education (3) Applications of theory and research related to higher mental problem-solving. Prereq: 510 or consent of instructor. F

515 Educational Applications of Behavioral Theories of Learning (3) Behavioral theories and research, conditioning, observational learning, and ethological learning as systems apply to student motivation, discipline and learning. F, Su

516 Educational Applications of Cognitive Learning Theories (3) Cognitive theory and research, social learning, attribution and information processing as systems apply to education. Prereq: 515 or consent of instructor. F

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

520 Statistics and Research Design: Conceptual (3) Consumer-oriented, conceptual treatment of statistics, research design, and quantitative basis of testing. E

521 Statistics and Research Design: Application (3) Data collection and analysis. Descriptive techniques, estimation, logic of hypothesis testing and selected parametric and nonparametric tests. For Master's students conducting thesis and beginning doctoral students. Use of computer statistical packages. F, Su

525 Formal Measurement in Education and Counseling (3) Principles of test construction and item analysis. Survey of standardized tests of intelligence, achievement, aptitude, vocational interest, attitudes and personality. Prereq: 520 or equivalent. F, Su

526 Informal Methods of Assessment (3) Development and use of rating scales, check-lists, observation, test scores and case reports in assessment and counseling of children and adults. Prereq: 525, Sp

540 Seminar in School Psychology (3) Essentials of theory and practice of school psychology as professional specialty. Consideration of history and current issues in school psychology. Sp

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

542 Practicum in Psychoeducational Assessment (3) Application of assessment skills to clients in learning environments. Coreq: 541 or consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. F, Sp

545 Psychoeducational Consultation (3) Use of two and three-person models of consultation in educational and therapeutic settings based on behavioral, ecological, social learning and cognitive-behavioral theories. F

546 Practicum in Consultation (3) Application of consultation skills to educational settings. Coreq: 545. Sp

549 Internship in School Psychology (1-6) Supervised employment in departmentally approved school psychology internships. Personal relationship with student, school psychology program and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only. E

550 Introduction to Pupil Personnel Programs (3) History, philosophy, professional standards, counselor role in relation to school staff and mental health professionals, and ethics of profession. F

551 Theory and Practice of Counseling (3) Philosophical bases of helping 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: Application and use of career and educational resources in personal 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 individual clients. Prereq: Admission to program; 431, 525, 551 and consent of instructor. May be repeated. Maximum 9 hrs. E

556 Seminar in Community Agency Counseling (1) Overview to professional roles, code of ethics, certification requirements, and role identity of community agency counselors. May be repeated. Maximum 2 hrs. S/NC only. F, Su

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

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

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

561 Development and Operation of School Counseling Programs (3) Management of comprehensive school counseling programs to include needs assessment, program goals, personnel development, programming, evaluation, and use of computer-based program management software. Prereq: 550. Sp, Su

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

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


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/NP only. E

602 Directed Research (1-3) Instructor- or student-initiated group investigation of empirical and theoretical problems in educational and counseling psychology. May be repeated. Maximum 12 hrs. S/NC only. E

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

609 Advanced Seminar in Curriculum and Learning (4) (Same as Curriculum & Instruction 609.)

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

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

649 Advanced Internship in School Psychology (1-9) Supervised experience as school psychologist in departmentally approved internship site for doctoral level students. Prereq: Admission to 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 educational psychology. May be repeated. Maximum 2 hrs. S/NC only. F

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

659 Internship in Counselor Education (1-6) Supervised employment in departmentally approved internship sites in counselor education. May be repeated. Maximum 12 hrs. S/NC only. E

660 Seminar in Educational Psychology (1) Major professional issues, role and scope of educational psychology as field of study and practice. Prereq: Admission to doctoral program in educational psychology. May be repeated. Maximum 2 hrs. S/NC only. 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

662 Applied Research Design (3) Planning of empirical investigations, collection of data, and drawing of inferences from evidence gathered. Prereq: Two-course sequence in statistics. A

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

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 production. Prereq: 585, or equivalent. F, Sp

666 Practicum in Instructional Planning (3) Development and management of course or program of instruction in educational psychology. Prereq: 665, or consent of instructor. E

669 Internship in Educational Psychology (1-6) Supervised employment in departmentally approved education
670 Foundations of Counseling Psychology (3) History, theory, research and practice of counseling psychology. Prereq: Admission to counseling psychology doctoral program. May be repeated. Maximum 8 hrs. F,Sp

671 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in assessment of clients. Prereq: 525, 552 or consent of instructor. A

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

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

674 Practicum in Counseling Psychology (3) Supervised practice of individual counseling. Minimum 150 clock hrs required each semester. Prereq: Admission to counseling psychology doctoral program, 555, and consent of instructor. May be repeated. Maximum 6 hrs. E,Sp

675 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling. Prereq: 655, or 674, or consent of instructor. S/NC only. Sp

676 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. E

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

Assistant Professors:

Grubb, James J., M.S. Indiana State
High, Katherine N. (Adjunct) Ohio State

Ph.D.

Ed.D.

Visiting Professors:

Bogue, Grady, Ed.D. Memphis State

Mary Jane Connelly, Head

Educational Leadership

(College of Education)

MAJORS

DEGREES

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
Melmine, Malcolm C., Jr., Ph.D. Florida State
Pecolo, C. M. (Emeritus), Ph.D. Iowa
Roney, Robert K. (Emeritus), Ed.D., Tennessee
Stollar, Dewey H. (Emeritus), Ph.D.

Ohio State

Trusty, Francis M. (Emeritus), Ed.D. Stanford
Ubben, Gerald C., Ph.D. Minnesota
Venditti, Fred P. (Emeritus), Ed.D. Northern Colorado

Associate Professors:

Asken, Jerry W. (Adjunct), Ph.D. Ohio State
Connelly, Mary Jane (Liaison), Ed.D. VPI
Gross, Francis M. (Adjunct), Ed.D. Tennessee
Hussen, Peter M., Ed.D. Stanford
Mertz, Norma T., Ed.D. Columbia

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 9 hours must be in a cognate area within the college and 6-9 hours outside the college unless the student has a Master's degree in a field outside the College of Education. Two consecutive semesters of 604 must be taken during residence. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as well as an oral exam over the dissertation.

For the Ed.D. program, the Ed.D. program for practicing school administrators. Please contact the department for further information.

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

Educational Administration and Supervision

GRADUATE COURSES

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

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

503 Problems in Lieu of Thesis (3-6) May be repeated. S/NC only. E
513 Administrative and Organizational Theory in Education (3) Introduction to the theoretical 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 and conflict resolution skills, personnel motivation, conflict management skills, and role of values, attitudes, and expectations in administration. F, Su

516 Research for School Administrators (3) Descriptive, experimental, and quasi-experimental designs to help students without quantitative backgrounds to read and understand technical professional literature. Introduction to inferential 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, ethical, cultural, and racial environments in which schools operate. Prereq: M.S. introductory core or consent of instructor. F, Su

533 Administrative Applications of Micro Computers (3) DOS, word processing, data base management, spreadsheets, 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 systems. Prereq: M.S. introductory core or consent of instructor. F

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. E

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

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

554 School Law (3) Logical arrangement of case and statutory materials for public school administrators and teachers; problems concerning law and public education. Prereq: M.S. introductory core or consent of instructor. F, Su

580 Internship in Educational Administration (3) Field experience in appropriate educational setting working directly with administrator. At end of planned program of study. Placement by department assignment. Some on-campus classes in conjunction with 593 or 595. Prereq: 21 hrs in educational administration and supervision or consent of instructor. E

582 Educational Leadership and District-Level (3) Role of central administrative team; relationships, behaviors, concepts for developing leadership, 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. Simulation materials and field-based activities. Combination lecture and seminar 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 school administration. 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


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

605 Advanced Seminar in Administrative Theory (2) Interdisciplinary seminar. Readings selected by faculty for research and scholarly value from early to current classic theoretical studies and current periodical literature in educational administration. Required of Ph.D. students in Education. Prereq: Doctoral student in Education.

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

611 Current Issues in Educational Administration (1-3) Current topics for practicing school administrators, selected each semester and presented by specialists. 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. Prereq: 543. F

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

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

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

629 Seminar in Politics of Education (3) Political theories and practices as they effect operation of public school systems and higher educational institutions. Interdisciplinary discussions of community power structures and special interest groups, based on literature and research from education, sociology, and political science. Field inquiry. Prereq: 523, 616 or equivalent or consent of instructor. F

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

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

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

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

655 State-Federal Relations in Education (3) Interrelationships of federal, state, and local responsibilities and organization for education by analysis of traditional, legal, fiscal and functional aspects of educational partnership. Funding partnerships: discussion of grant proposal development processes. Sp, Su

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

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

670 Values and Ethics in Educational Leadership (3) Examination of moral and ethical dimensions of work of educational administrators; assistance to current and prospective administrators to deal with dimensions in knowledgeable, reflective and principled ways. (Same as Higher Education 670.)

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

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

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

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

Higher Education

**GRADUATE COURSES**

455 Seminar in Student Leadership (1) Knowledge and skills in leadership roles for resident assistants, student government leaders, student activities, and other student organizations. Topics to be assigned. May be repeated. S/NC or letter grade. E

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any 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, solicitation, personnel policies, 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
Electrical and Computer Engineering

(College of Engineering)

MAJOR DEGREES

Electrical Engineering .................... M.S., Ph.D.

Joseph M. Googe, Head

Professors:
Alexeff, Igor, PE, Ph.D. .............. Wisconsin
Ballester, J. Milton, Ph.D. .............. Georgia Tech
Birdwell, J. Douglas, Ph.D. .......... MIT
Bishop, Asa O., Jr., Ph.D. ............. Clemson
Blalock, T. Vaughn (Liaison), Ph.D. . Tennessee
Bodenheimer, Robert E., Ph.D. ..... Northwestern
Bose, Bimal K. (Condra Chair of Excellence), Ph.D. ............. Calcutta

Bouldin, Donald W., PE, Ph.D. ...... Vanderbilt
Cunningham, James W. (UTSI), Ph.D. ........ Tennessee
Gonzalez, Rafael C. (Distinguished Prof.), Ph.D. ........ Florida
Googe, Joseph M., PE, 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., PE, Ph.D. ..... Tennessee
Lawler, J. Scott, Ph.D. ............... Michigan State
Leffert, Will O. (Emeritus), M.S. ....... Tennessee
Neff, Herbert P., PE, Ph.D. ............ Auburn
Pace, Marshall O., PE, Ph.D. ......... Georgia Tech
Pierce, J. Frank (Distinguished Prof.), PE, Ph.D. ........ Pittsburgh
Roberts, M. J., Ph.D. ................. Tennessee
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. .... New York
Trivedi, Mohan M., Ph.D. ............. Utah State
Weaver, Charles H. (Emeritus), PE, Ph.D. ........ Wisconsin

Associate Professors:
Abidi, M. A., Ph.D. .................. Tennessee
Bomar, Bruce W. (UTSI), Ph.D. .... Tennessee
Brazakovic, Dragana, Ph.D. ......... Florida
Crilly, Paul B., Ph.D. ............... New Mexico State
Joseph, Roy D. (UTSI), Ph.D. ......... Case Western
Koch, Daniel, Ph.D. ................. Missouri (Rolla)
Rosenberg, David, Ph.D. ............. New York
Rochelle, James M., Ph.D. ........... Tennessee
Wallace, J. Wayne, Ph.D. ............ Tennessee

Assistant Professor:
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 will offer its Master's program in electrical and computer engineering. The 500-level work in electrical and computer engineering courses must include at least 8 hours in the student's major area.

Admission Requirements

Students applying for admission to the Master of Science program must hold a B.S. in Electrical Engineering. All students must be in good standing with a minimum of 3.0 grade-point average in the last two years of undergraduate work and a minimum of 3.0 grade-point average in the last two years of undergraduate work.

Students who hold the B.S. or B.A. in a field other than electrical engineering are also expected to have a background equivalent to that obtained by earning credit with a minimum 3.0 grade-point average in Electrical Engineering courses normally taken in 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 must have a minimum of 3.0 grade-point average in the last two years of undergraduate work, and a minimum of 3.0 grade-point average in the last two years of undergraduate work.

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 one or more courses at the 400-level or higher, which have been approved by the E.C.E. Graduate Committee.
3. An additional 12 semester hours of 500-level work in electrical and computer engineering courses of 6 semester hours of 500-level work in one area of electrical and computer engineering courses and 6 semester hours of 500-level work in another area approved by the student's Master's committee.
5. A final oral examination covering the thesis and related coursework.

THE DOCTORAL PROGRAM

The Ph.D. with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computer science, communication theory, computer engineering, power systems, solid-state electronics, and control systems. Applicants must submit scores on the Graduate Record Exam. Specific requirements include:

1. A Master of Science or Master of Engineering degree.
3. A minimum of 24 semester hours of work in electrical and computer engineering courses at the 500 and 600 levels.
4. A minimum of 9 semester hours of 500-level coursework. At least 3 semester hours of this work must be in an area other than the student's major area.
5. A minimum of 12 hours of mathematics courses approved by the Electrical and
Computer Engineering Graduate Committee. All 12 hours must be 400-level or above, and at least 6 hours must be at 500-level or above.

3. One foreign language if the student's faculty committee determines that a reading knowledge of a foreign language is crucial to the student's research efforts.

4. Satisfactory performance on both a qualifying and comprehensive examination. The qualifying examination is prepared by the Electrical and Computer Engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) mathematics and transform methods, and (2) basic electrical network analysis, are required of all Ph.D. students. Areas (3) and (4) are usually chosen from two of the graduate course divisions in the department and cover material from undergraduate courses and first year graduate courses. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the graduate program. The qualifying examination is normally taken after the completion of 24 hours of graduate coursework or immediately after completion of a Master's degree. A minimum of 18 hours of graduate coursework must be completed after the student has taken the qualifying examination the first time.

5. The comprehensive examination is prepared by the student's doctoral committee and consists of a 3-hour written examination in the student's major area, a 2-hour written examination in a related area, and an oral examination. The comprehensive examination is normally taken at least six months after passing the qualifying examination. Part of the comprehensive oral examination will be a defense of a formal dissertation proposal. The comprehensive examination must be passed and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D.

6. Participation in departmental seminars.

A. A minimum of 24 hours of doctoral dissertation.

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

Departmental actions regarding a graduate student may be appealed in writing, first to the Department Graduate Committee and then to the Department Faculty.

GRADUATE COURSES

Note: Courses required in the Electrical and Computer Engineering undergraduate curriculum cannot be used in either the M.S. or Ph.D. programs. No 400-level course may be used toward a graduate degree in Electronic 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, nonrecursive and recursive filter design, and CAD tools for filter design and system implementation and projects.


412 Linear Control System Design (3) Classical and modern techniques for design and compensation of linear feedback control systems. Prereq: Linear System Analysis.

413 Passive and Active Network Synthesis (3) Realization of network synthesis techniques, passive network design, transfer function synthesis, approximation theory, topics in active network synthesis. Prereq: 312.

421 Electric Energy Systems (3) Structure and operation of electrical energy grid; load flow; economic loading; planning; control; reliability. Balanced and unbalanced faults; system protection; system stability. Prereq: Electric Power Systems Analysis.

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; describing equations for a.c. machines and their numerical solutions. Includes laboratory experiments and projects. Prereq: Electric Energy System Components.

423 Power Electronics (4) Principles and characteristics of power semiconductor devices, single-phase and polyphase power-controlled converters, converter control, ac phase controller, voltage-fed inverter and dc-dc converter principles, industry applications. Includes laboratory experiments and projects. Prereq: Electric Energy System Components.


431 Digital and Analog Integrated Electronics (4) Basic processing and fabrication of active and passive components for monolithic integrated circuits; characteristics of bipolar and field effect transistors in typical analog and digital integrated circuit designs; standard digital logic circuits including TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; digital design concepts for op-amps, comparators, references, regulators, and other linear functions. Includes laboratory experiments and projects. Prereq: Electric Circuits.

432 Analog Signal Processing Electronics (4) Transducers and instrumentation; design of active and passive components for monolithic integrated circuits; operational, instrumentation, and isolation amplifiers, operational amplifiers and logarithmic converters, multipliers, and function generators, integrated circuit application in active filters, data detection, multiplexers, modulation and demodulation, sample and hold, and comparators. Includes laboratory experiments and projects. Prereq: Electric Circuits.

433 Electronic Amplifiers (4) Feedback amplifier principles; wideband linear amplifier design; radio frequency and audio power amplifier design; linear regulated power supply design; oscillator principles. Includes laboratory experiments and projects. Prereq: Electric Circuits.


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, ionosphere. Reflections from earth; effects on link reliability. Prereq: Electromagnetics.


453 Data Acquisition Systems (4) Digital-to-analog conversion techniques: Quantization, R-2R ladder networks; error analysis of D/A converters; sample hold circuits, analog-to-digital conversion techniques; open loop systems; dynamic range, closed loop systems; digital systems; digital logic approximation theory, topics in active network synthesis; error analysis of A/D converters; accuracy, linearity, drift, dynamic range, frequency resolution, gain, and shielding and grounding, automatic testing of A/D and D/A converters; device service routines; signature analysis. Includes laboratory experiments and projects. Prereq: Introduction to Logic Design of Digital Systems.


461 Plasma Magnetohydrodynamic Engineering (3) MHD approximation; MHD waves and instabilities; MHD in plasma accelerators; plasma devices; high density plasma waves; applications to fusion energy, industry, and astrophysics. Prereq: 361.

462 Plasma Kinetic Theory Engineering (3) Kinetic theory; beam-plasma system; driven waves in plasma; transmission lines; multiple beam systems; Landau theory; microwave generation in plasmas and traveling wave tubes; free electron masers in circular geometry; gyrotrode and orbitron. Design of plasma devices. Prereq: 361 or consent of instructor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasmas, principles of fusion reactors, and engineering and physics constraints on fusion reactors. Prereq: Introduction to Plasma Engineering for ECE majors, or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Continuation of 463. Principles and phenomenology of tokamak reactor; advanced magnetic confinement concepts, advanced fusion fuels, fusion technology, plasma engineering, and fusion reactor design studies. Design project which integrates material in 463 and 464. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 464.)

469 Plasma Laboratory (1) Experiments and design project illustrating material covered in 461 and 462.


88 Electrical and Computer Engineering
472 Introduction to Digital Image Processing (3) Basic methods for digitizing, storing, processing, and displaying images. Computational procedures for image enhancement, restoration, coding, and segmentation. Prereq: Electrical and Computer Engineering, Computations and Communication Systems I, or Probability and Statistics for Scientists and Engineers and FORTRAN.


493 Special Topics in Electrical and Computer Engineering (1-3) Topics related to recent developments and current practice. Prereq: Consent of instructor. May be repeated.

494 Special Problems in Electrical Engineering (1-3) Problems involving library and experimental research. Prereq: Consent of instructor. May be repeated. Maximum 5 hrs.

499 Senior Seminar (1) Topics of interest discussed in weekly seminars or written by each student. Prereq: May be repeated. Maximum 2 hrs. S/NC or letter grade.

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 Modern Transform Methods (3) Fourier and Laplace transform and complex variables theory. Z-transform, difference equations and distributed parameter systems.

504 Random Process Theory for Engineers (3) Probability and random variables as approached by set theory. Statistical averages and transformations of random variables. Random processes, stationarity, correlation functions and temporal averages, power spectrum and spectral analysis as applied to response of systems to random signals.

505 Digital Signal Processing I (3) Discrete-time signals and systems, sampling, fast Fourier transform (FFT) and fast convolution, design of FIR filters and IIR filters.

506 Digital Signal Processing II (3) Filter properties in the Z and Fourier transform domains, structures for digital filters, sampling and reconstruction, hardware implementation of digital filters.

507 Application of Numerical Linear Algebra in Systems and Control Engineering (3) (Same as Chemical Engineering 507 and Mechanical Engineering 507.)

511 Linear Systems Theory (3) State space models of linear dynamical systems, linear algebra, state transition map, matrix exponential, controllability, observability, realization theory, and stability theory. Coreq: 508.

512 Multivariable Linear Control System Design (3) Design of controllable and observable systems, which satisfy constraints on robustness to plant uncertainties, disturbance rejection, command following. Prereq: 511.

515 Adaptive Control and System Identification (3) Adaptive control of linear deterministic and stochastic systems, adaptive control, and computer engineering computations. Includes laboratory experiments and projects. Prereq: 511-2 or 518-9.

516 Passive and Active Network Analysis and Synthesis I (3) Frequency and time domain techniques for network analysis, network reliability, synthesis algorithms.


519 Control Systems Design II (3) Digital control, variable structure control, state-space design of SISO systems, use of estimators and observers, comparison of classical and state-space methods of control system design, and applications for control system instrumentation. Prereq: 518.

521 Power Systems Analysis I (3) Matrix-vector representations of power networks, sequence modeling of power system components, unbalanced short and series faults. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prereq: 421 or equivalent.

522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient and dynamic stability, power system stability, and matrix-vector form with application to large scale power systems. Prereq: 521.

523 Power Electronics and Drives (3) Forced commutated inverters, advanced PWM techniques, current limited induction motor vector control, and electric and scalar control of induction machines, parameter variations, control principles of synchronous machines.


528 Advanced Electrical Machines I (3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for rotating machinery. Prereq: 421 or equivalent.

529 Advanced Electrical Machines II (3) Park's transformation and two-axis model, transient behavior of isolated and interconnected rotating machines. Prereq: 528.

531 Advanced Analog Electronics I (3) Physical operation of modern electronic devices; semiconductor devices: diodes, bipolar transistors, J-FETs, and MOS-FETs. Small-signal equivalent circuits and noise models of active devices. Project laboratory. Prereq: 431, 432, 433, or consent of instructor.


542 Radiation and Propagation (3) Linear antennas, loop antennas, aperture antennas, optical transfer function. Canonical problems of modern geometrical theory of diffraction (GTD) and wave geometrical optics approximation, and accounting of far fields and near fields due to edge and surface diffraction. Horn, lens, and reflector antennas; computation of radar cross-section. Prereq: 541.


545 Introductory Microwave Networks and Components (3) Scattering and transfer representation for multiports; unilateral and bilateral microwave and millimeter wave devices. Component and system parameter measurements. Design and analysis by network synthesis. Prereq: 544.


552 Digital System Design II (3) State identification and structure realizations of sequential machines. Digital system architecture design: microprogramming and interrupt control. Prereq: 551.

561 Plasma Diagnostics I (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods including temperature and bandwidth methods and high temperature plasmas of interest in fusion research. Laboratory safety, data reduction and presentation, microprocessor based data handling and analysis, and reduction of time series data. Prereq: 481, 483, or consent of instructor. (Same as Nuclear Engineering 561.)

562 Plasma Diagnostics II (3) Laboratory instruction in operation of plasma diagnostic instruments in plasma science laboratory, experience with high voltage, vacuum, RF, and digital data handling techniques. Prereq: 561. (Same as Nuclear Engineering 562.)

563 Plasma Engineering (3) (Same as Nuclear Engineering 563.)

564 Fusion Technology (3) (Same as Nuclear Engineering 564.)

566 Industrial Plasma Engineering I (3) Low temperature plasma physics relevant to industrial applications: kinetics, instabilities and dynamics of liquid and solid, plasma deposition and etching, space propulsion systems, plasma chemistry, plasma lighting devices, insulating and diagnostics and breakdown in plasma arc, 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 recognition, syntactic and semantic methods. Prereq: 472 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.


598 Graduate Seminar (1) Topics of interest discussed in weekly seminar. May be repeated. Maximum 6 hrs. S/NC or letter grade.
658 Special Topics (1-3) May be repeated. Maximum 9 hrs.
660 Doctoral Research and Dissertation (3-15) P/NP only. E
612 Advanced Systems Theory (3) Game theory, dual control problem, hierarchical systems, and information structures. Prereq: 611.
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: 503.
621 Modern Techniques for Electric Energy Systems I (3) Analysis of electric energy systems. Prereq: Consent of instructor.
623 Advanced Power Electronics and Drives (3) Phase-controlled cycloconverters, cycloconverter-fed ac drives, resonant converters, vector and scalar control of synchronous machines, static Kramer drives, static Scherbius drives. VSCF generation, modern control theory in ac drives.
624 Electrical Insulation (3) Principles, testing, and case studies. Basic principles of aging, loss, charging, conduction, breakdown in vacuum, gas, liquid, solid, and composite insulations. Testing with low noise instrumentation, pulse height analysis, optics, acoustics, and related statistics and distributed parameter effects. Case studies drawn from active research, power systems, electronic circuits and devices, shielding, and stress grading. Prereq: 503, 504, and consent of instructor.
621 Advanced Topics in Electronic Instrumentation I (3) Based on particular interests of students. Fundamental physical processes in instrumentation transducers; thermoelectric, magnetoelectric, electromechanical, and quantum-mechanical devices. Prereq: 511-52 and consent of instructor.
633 Advanced Topics in Information Science I (3) Detection theory, coding theory, system identification. Signals with unknown parameters: optimal filter synthesis, adaptive systems; sequential detection; suboptimal detection. Prereq: 504 or consent of instructor.
634 Advanced Topics in Information Science II (3) Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding methods. Identification schemes: deterministic, stochastic, and hierarchical methods. Prereq: 504.
651 Computer-Aided Design of VLSI Systems I (3) Fabrization of microelectronic devices: computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-52 or consent of instructor.
652 Computer-Aided Design of VLSI Systems II (3) Computer-aided design tools; design and implementation of fully custom very large scale integrated (VLSI) circuits; design for testability; testing of fabricated chips. Prereq: 551.
663 Advanced Plasma Physics I (3) Basic concepts of high temperature plasma physics. Magnetohydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-2, 461-2 or 563-4, or consent of instructor. (Same as Physics 563.)
671 Image Processing and Robotics I (3) Three-dimensional scene modeling and recognition, multi-sensor systems. Prereq: 572 or 573 or consent of instructor.
672 Image Processing and Robotics II (3) Stereo vision, shape theory. Prereq: 571.
673 Image Processing and Robotics III (3) Time-variant imagery, path planning and navigation. Prereq: 572.
681-82 Quantum Electronics (3,3) Prereq: Consent of instructor.
691 Advanced Graduate Seminar (1) Research in department. May be repeated. S/N/C or letter grade.
692 Special Topics (1-3) Advanced topics of current interest to Ph.D. students in Electrical Engineering. May be repeated. Maximum 9 hrs.

Engineering Science and Mechanics

(Majors of Engineering

MAJOR DEGREES

Engineering Science ......................... M.S., Ph.D.
T. G. Carley, Acting Head

Professors:

Associate Professors:
Boulet, J. A. M., Ph.D., Ph.D. ............... Stanford Caruthers, J. E. (UTSI), Ph.D., Ph.D. ...... Georgia Tech

Engles, R. C. (UTSI), Ph.D., Ph.D. .......... VPI Matthews, A., Ph.D., Ph.D. ................. Illinois McCay, M. H. (UTSI), Ph.D., Ph.D. .......... Florida Steinhoff, J. S. (UTSI), Ph.D., Ph.D. ....... Chicago

Assistant Professors:

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized curricula in engineering, mathematics, or one of the physical or biological sciences. Program concentrations include solid mechanics, fluid mechanics, computational mechanics, biomedical engineering, and optical engineering (UTSI only). In each of these concentrations, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant is advised as to any prerequisite courses before entering a program; the student's program of study must be approved by his/her advisory committee, and must comply with the requirements of The Graduate School. The student's major professor may be selected from a department other than the Department of Engineering Science and Mechanics; however, at least one member of the student's graduate advisory committee must be on the faculty of the Department of Engineering Science and Mechanics. A departmental application is required in addition to The Graduate School application. The names and addresses of four references must be included with the departmental application. The flexibility and interdisciplinary aspect of the program concentrations are intended to be of particular interest to prospective students currently employed in research, development, or design activities and whose interests in continuing education (either full-time or part-time) lie at one of the interfaces between science and engineering or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek preparation for employment in engineering areas requiring specialization in mechanics or in related interdisciplinary studies such as biomechanics.

THE MASTER'S PROGRAM

Two M.S. options are offered: option I requires a thesis, while option II does not. The second plan is restricted to those students who have had significant engineering professional work experience. In option I, a minimum of 30 semester hours including the thesis is required. In option II, a minimum of 33 hours is required. The requirements include the following:

Hours Credit

I II
Mathematics ................................. 6 6

Engineering courses* (Major concentration may include but is not restricted to courses offered by the Engineering Science and

*Electrical, mechanical, civil, and computer engineering courses are also available.

Day and evening sections are available.
courses in this group to be taken will depend on the student's selection. The number of courses which constitute one or two areas of concentration will normally be numbered 500 and above, with a minimum of 12 semester hours of 600-level courses, and a maximum of 24 semester hours in other 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 Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

4. 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.

The 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.

The qualifying examination will be administered by the department's Graduate Studies Committee. The examination will be written and will cover at least four graduate level subject areas. One subject area will be mathematics, and the others will be designated by the student subject to the approval of the department's Graduate Studies Committee.

The comprehensive examination is to be taken by students within 6 credit hours of completion of coursework required for the Ph.D. The examination is to be administered by the student's advisory committee and shall consist of both a written and an oral portion.

6. After successfully passing the qualifying and comprehensive examinations, the student must present the Ph.D. dissertation research proposal to the student's advisory committee and receive committee approval of the proposal before being admitted to candidacy for the Ph.D.

7. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to participate in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Engineering Science is available to residents of the state of Florida (concentration in biomedical engineering only). Additional information may be obtained from the 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-third of minimum required credits hours in a Master's degree program must be at or above the 500 level.

GRADUATE COURSES

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time dependent and cyclic dependent properties. Prereq: 321, Materials Science and Engineering 201. 3 hrs or 2 hrs and 1 lab.

423 Fracture-Safe Design (3) Critical review of variables controlling fracture toughness: part and flaw geometry, temperature, loading rate, section size, material; characterization of fracture toughness by stress intensity factors, strain energy release rates, integral COD, data, transition temperature tests; use of fracture toughness data in design. Prereq: 321 and Materials Science and Engineering 201. (See also Materials Science and Engineering 475.) 3 hrs or 2 hrs and 1 lab.

425 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasounds, acoustic emission methods. Laboratory. Prereq: 321, Materials Science and Engineering 201. (Same as Physics 475.)

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; gyroscopes; 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 or acoustics.

442 Fluid Mechanics II (3) Differential forms of basic laws; compressibility, two-phase flow, shock, dust, flow; with heat transfer and friction; open channel flow, critical flow, energy methods, internal and external viscous flows, boundary layers, elementary turbulence models. Prereq: 341, Mathematics 231.

461 Experimental Stress Analysis (3) Theory, techniques, instrumentation of resistance strain gauges; theory and techniques of brittle coating method; introduction to other strain gauge techniques. Prereq: 351, Electrical and Computer Engineering 301. 2 hrs and 1 lab.

463 Photomechanics (3) Introduction to photoelasticity, photoelastic coating method, Moiré' method, interferometry, and holography. Prereq: 321, Physics 232. 2 hrs and 1 lab.

466 Dynamic Data Acquisition (3) Use and calibration of instrumentation for measuring and recording dynamic events; Fourier analysis, transfer function analysis, digital signal processing, transduction, experimental parameter estimation with applications to modal vibration analysis. Prereq: 431, Electrical and Computer Engineering 301, 2 hrs and 1 lab.

471 Clinical Engineering and Bioinstrumentation (3) Function and characteristics of health care delivery systems; hospital organization and health care economics; development and management principles for hospital-based clinical engineering program. Biomedical instrumentation system operational characteristics; performance of transducers, signal conditioning, data readout and storage devices; evaluation of commercially available systems, selection and procurement methods, custom-designed system, equipment maintenance and control programs for hospitals. Ethical issues and professionalism in clinical engineering. Prereq: Biomedical engineering, Introduction to Pattern Recognition.

473 Biomechanics (3) Mechanical properties of living tissues; biomechanics of injury; mechanics of prostheses; material compatibility of prosthetic devices; biomechanical problems related to impact. Prereq: 321.

475 Design of Artificial Internal Organs (3) Design, development and evaluation of artificial internal organs; analysis of transport processes in therapeutic devices for design optimization; review of currently available devices; federal regulation and ethical considerations. Prereq: 341, Mathematics 231.


494-95 Special Engineering Science Topics (1-3, 1-3) Problems related to recent developments and practice. Open to juniors or seniors. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

502 Registration for Use of Facilities (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.

521-22 Advanced Mechanics of Materials (3, 3) Three-dimensional stress-strain relations, strain and strain, unsymmetrical bending, energy methods, thick-walled pressure vessels, beams on elastic foundation, beam columns, introduction to elementary theory of elasticity. Prereq: 322 and Mathematics 431.

523 Theory of Elasticity (3) Equations of equilibrium, strain-displacement relations compatibility, and constitutive equations in three-dimensions. Beams, disks, thick-walled tubes, plates with holes; stress concentrations. Airy and complex potential stress function, plane stress and plane strain in rectangular and polar coordinates. Thermal stresses in beams, rings, plates, and shells; thermal buckling problems.

525 Theory of Plates (3) Classical bending theory of thin plates; thick plates; buckling and large deflection problems. Prereq: 523 or 535.


Dykeman, Wilma (Adjunct), B.A. , Northwestern University
Ensor, Allison R. (Liaison), Ph.D. , Indiana University
Finnean, Richard J. (Hodge Chair of Excellence), Ph.D. , North Carolina State University
Goslee, Nancy M., Ph.D. , Yale University
Hefferman, Thomas J., Ph.D. , Cambridge University
Kelly, Richard M. (Lindsay Young Professor), Ph.D. , Duke University
Leggett, B. J. (Distinguished Professor), Ph.D. , Florida State University
Lofaro, Michael A., Ph.D. , Maryland University
Maland, Charles J., Ph.D. , Michigan State University
Penner, A. Richard, Ph.D. , Colorado State University
Reese, Jack E., Ph.D. , Kentucky University
Sanders, Norman J. (Lindsay Young Professor), Ph.D. , Princeton University

Associate Professors:
Bensel-Myers, Linda D., Ph.D. , Oregon State University
Dumas, Bethany K., Ph.D. , Arkansas State University
Dunn, Allen, Ph.D. , Washington State University
Garnett, Stanton B., Jr., Ph.D. , Princeton University
Gill, J. E., Ph.D. , North Carolina State University
Goslee, David F., Ph.D. , Yale University
Hutchinson, George, Ph.D. , Indiana University
Kazat, Marilyn, Ph.D. , Rutgers University
Keene, Michael, Ph.D. , Texas A&M University
Kleil, Iona, Ph.D. , Illinois State University
Robinson, Frank K., Ph.D. , Texas Tech University
Smith, Arthur, Ph.D. , Houston University
Stillman, Robert, Ph.D. , Pennsylvania State University
Zomchick, John, Ph.D. , Columbia University

Assistant Professors:
Atwill, Janet, Ph.D. , Purdue University
Barton, Kerri, Ph.D. , Texas Christian University
Shatt, Rakesh, Ph.D. , Illinois State University
Hammond, Patsy G., M.A. , Tennessee Technological University
Hirst, Russel, Ph.D. , Rensselaer Polytechnic Institute
Howes, Laura L., Ph.D. , Columbia University
Hubbard, Dolan, Ph.D. , Illinois State University
Jennings, La Vinia, Ph.D. , North Carolina State University
Papke, Mary E., Ph.D. , McGill University

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 Department of English does not accept students in non-degree or provisional status. A student who wishes to enter the department must apply for degree seeking status for his/her application to receive consideration for admission to any graduate program in English.

THE MASTER'S PROGRAM

Requirements
Coursework: A minimum of 24 semester hours in English beyond the B.A., to include 6 hours at the 600 level; 12 additional hours at the 500-600 level (Only 3 hours of 593 Independent Study may be applied toward the M.A.); and 6 hours for graduate credit at any level, including the 400 level. In this coursework, students must maintain at least a 3.0 GPA.

Thesis Option: Written under the direction of a faculty member of the department and approved by a committee of two other faculty members. Six semester hours of credit will be given.

Non-Thesis Option: Six hours of additional courses at the 500-600 level, making a total of 30 hours of required coursework.

Coursework: A minimum of 24 semester hours of required coursework.

Dissertation: Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. The research and writing requirement must be directed by a faculty member of the department and approved by a doctoral committee of three or four other faculty members.

Writings: A language requirement met in one of the following ways:
1. Two languages approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade of B or better, at least three of which must be from English 508 or 509 History of the English Language.

The nature and length of each project will be determined by the Director of Graduate Studies after consultation 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 outline 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.); a special three-hour course in teaching composition; and 12 additional hours at any level, including the 400 level. Up to 6 of these hours may be taken in some cognate field or fields such as history, philosophy, French. These courses must be from those approved for graduate credit. All other coursework must be in the English Department. In this coursework, students must maintain at least a 3.5 GPA.

Dissertation: Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. The research and writing of the dissertation will be directed by a faculty member of the department and approved by a doctoral committee of three or four other faculty members.

Writings: A language requirement met in one of the following ways:
1. Two languages approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade of B or better, at least three of which must be from English 508 or 509 History of the English Language.

The nature and length of each project will be determined by the Director of Graduate Studies after consultation 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.); a special three-hour course in teaching composition; and 12 additional hours at any level, including the 400 level. Up to 6 of these hours may be taken in some cognate field or fields such as history, philosophy, French. These courses must be from those approved for graduate credit. All other coursework must be in the English Department. In this coursework, students must maintain at least a 3.5 GPA.

Dissertation: Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. The research and writing of the dissertation will be directed by a faculty member of the department and approved by a doctoral committee of three or four other faculty members.

Writings: A language requirement met in one of the following ways:
1. Two languages approved by the Director of Graduate Studies in English. This requirement must be fulfilled by a passing grade of B or better, at least three of which must be from English 508 or 509 History of the English Language.

The nature and length of each project will be determined by the Director of Graduate Studies after consultation 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.
Language (offered in alternate years only). For
the other 3 hours, the student may either
come up the history of the English language or choose one other course in language taught in
the Department of English at the 500 or 600 level and approved by the Director of Graduate
Studies in English. These courses will not count
toward the minimum number of courses for the
Ph.D., and anyone electing this language option may not take the comprehensive examination in
linguistics.
Examinations: (1) A 4-hour qualifying examination taken before the end of the first
year of Ph.D. coursework; this examination is
given three times a year, with the M.A. written examination.
(2) A comprehensive written
examination which may be divided as the
department directs; see the English Department
Graduate Studies in 306 McClung Tower.

GRADUATE COURSES
Note: Students enrolling in English graduate courses must first register in the office of the Director of
Graduate Studies in 306 McClung Tower.

401 Medieval Literature (3) Reading and analysis of
selected medieval literary masterpieces in modern Eng-
lish.

402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Cressida in Middle English.

404 Shakespeare I: Early Plays (3) Shakespeare’s dramatic achievement before 1601. Reading and
discussion of selected plays from romantic comedies, in-
cluding 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, includ-
ing Othello; problem plays, including Measure for Measure; and dramatic romances, including The Tem-
post.

406 Renaissance Drama (3) English theatre between 1590 and 1640 through reading of representative plays by Shakespeare’s contemporaries: Marlowe, Webster, Jonson.

409 Spencer 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, and Wal
t.

411 Restoration and Eighteenth-Century Poetry and Prose (3) Dryden, Swift, Pope, Johnson, and their con-
temporaries; major works: Macaulay, the Age of Reason, and pope of Lock, Gulliver’s Travels, and Rasselas.

412 British Drama from 1660 to 1800 (3) Playwrights from Dryden and Wycherley to Goldsmith and Sheridan;

formal developments: heroic play, cynical comedy, af-
factive tragedy, and exemplary 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, Ruskins, Darwin, and Wilde.

420 The Nineteenth-Century British Novel (3) Scott to
Hardy.

421 Modern British Novel (3) Lawrence, Joyce, and
Woolf.

422 Women Writers in Britain (3) Literary conscious-
ness and works of women writers in Britain. (Same as Women’s Studies 422.)

431 Colonial, Federal, and Early National American Literature (3) From Columbus to Washington Irving.

432 American Romanticism and Transcendentalism (3)

433 American Realism and Naturalism (3)

434 American Modern Literature (3) World War I to
present.

435 American Novel before 1900 (3) From earliest
sentimental novels through Brown and Cooper, and
major figures to 1900: Hawthorne, Melville, Shawe, Cle-
man, and James.


441 Southern Literature (3) Southern writing from colonial period into twentieth century: 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 Language (3) Contents vary: particu-
lar genres, authors, or theories from 1845 to
present: Langston Hughes and Harlem Renaissance,
Richard Wright and Gwendolyn Brooks, writing by Black
women, International Black literature in English, and
Black American poetry.

451 Modern British and American Poetry (3) From
Yeats and Frost to Auden, Stevens, and more recent
poets.

452 Modern British and American Drama (3) O’Neill’s
works as precursors to modern dramaticists: Williams,
Miller, Albee, and representatives of Black theater, Bullins and
Black writers.

453 Continental Drama (3) Selection of plays (in Eng-
lishtranslation) by major European writers from late
Renaissance to present; eighteenth-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 master-
ing effective logical and emotional appeals.

460 Technical Editing (3) Editing technical material for
publication. Principles of style, format, graphs, layout,
and production management. Prerequisite: 456 and 459, or
consent of instructor.

461 Advanced Technical and Professional Writing (3) For students preparing for careers in industry, education,
and government who need technical writing skills. Writ-
ing of definitions, process descriptions, sets of instruc-
tions, descriptions of mechanisms, recommendation re-
ports, abstracts, proposals, and major reports. Prerequisite: Junior standing in student’s major or consent of
structor.

462 Writing for Publication (3) Principles and practices of writing for publication. Dissertations, theses, articles,
and reports in science and technology. Prerequisite: 459 or consent of instructor.

463 Advanced Poetry Writing (3) Further development of
skilis acquired in basic writing poetry course. Prerequisite: 363 or consent of instructor.

464 Advanced Fiction Writing (3) Further development of
skilis acquired in basic writing fiction course. Prerequisite: 365 or consent of instructor.

471 Sociolinguistics (3) Study of language in relation to
society: sociolinguistic and theoretical focus. Large-scale
units: tribes, nations, social groups. Prerequisite: 371 or 372
or Linguistics 200 or consent of instructor. (Same as Linguistics 471 and Sociology 471.)

472 American English (3) Phonological, morphological,
and syntactic characteristics of major social and regional
varieties of American English: origins, functions, and
implications for cultural pluralism. Prerequisite: 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.
Basic phonological structures of English. Teaching gram-
mar and phonology to non-native speakers; contrastive
analysis of English with other languages. Prerequisite:
Second year of a foreign language. (Same as Linguistics 474.)

475 Teaching English as a Second or Foreign Lan-
guage (3) Second language acquisition theory. Issues in
teaching four language skills to learners of English.
Material and methods of teaching speaking and writing;
preparation of materials. Observations of and team teach-
ing with experienced staff member. Prerequisite: English 474. (Same as Linguistics 475.)

480 British and American Ballad and Folktale (3)
Popular ballads and folktales of English, Scottish, and
North American tradition.

481 Studies in Folklore (3) Topics vary. May be
repeated with different topic. Maximum 6 hrs.

482 Major Authors (3) Content varies. Concentrated
study of at least one of most influential writers in
British or American literary history: e.g., Donne, Tennyson,
Jane Austen, Whitman, Franklin, 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 inte-
grated with reading, usually taught by professional au-
thor. 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. Particu-
lar directors, film genres, national cinema movements,
or other topics. May be repeated with consent of depart-
ment. Maximum 6 hrs. (Same as Cinema Studies 489.)

495 Introduction to Rhetoric and Composition (3)
Historical, theoretical, and empirical modes of inquiry in
rhetoric and composition and implications for teaching of
composition.

500 Thesis (1-15) S/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
coursentime before degree is completed. May not be used

toward degree requirements. May be repeated. S/NP
only. E

505 Teaching Freshman Composition (3) Introduction
to teaching Freshman English through study of various
techniques and philosophies of composition. Required of
all first-year teaching associates.

506 Introduction to Literary Research (3) Critical
examination of aims of English studies, profession of
English teacher, theory of literature, and methods of
research: collecting of information, evaluation of mate-
rial, and transmitting of results of scholarship.

507 Applied Criticism: The Rhetoric of Literary Forms
(3) Study and application of ways in which major critics
have analyzed form in poetry and prose fiction.
508 History of the English Language I (3) Phonological, morphological, and syntactic development of English language; Old and Middle English. F,A

509 History of the English Language II (3) Phonological, morphological, and syntactic development of the English language with concentration on developments after 1500, especially in American English. Sp,A

513-14 Readings in Medieval Literature (3,3) Reading and analysis of selected masterpieces of Old and Middle English literature and their Continental sources in Modern English.

520-21 Readings and Analysis in Selected Areas of Sixteenth- and Seventeenth-Century Prose, Poetry, and Drama (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.

530-31 Readings in English Literature of the Restoration and Eighteenth Century (3,3) Topics vary. Genre: poetry, prose, fiction, drama; or period: Restoration, earlier eighteenth century, later eighteenth century.

540-41 Readings in English Literature of the Nineteenth Century I and II (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.

550-51 Readings in American Literature from the Colonial Period to the Present (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.

552 Readings in Black American Literature (3) Content varies: genre, theme, literary movement, or other coherent emphasis.

560-61 Readings in Twentieth-Century Literature (3,3) Content varies: genre, theme, literary movement, or other coherent emphasis.

576 Introduction to Contemporary Criticism (3) Introduc- tory survey of twentieth-century literary criticism from New Criticism to present.

580 Fiction Writing (3) Advanced fiction projects under supervision of instructor and time for independent study. Prereq: Extensive background in reading and writing fiction.

581 Colloquium in Poetry Writing (3) Major poetic readings in literature and literary genres of Medieval English literature, read in Old and Middle English. Subject matter varies from year to year.

621 Studies in Chaucer (3) Seminar in text, interpretation, and criticism of Chaucer's writings. Prereq: Previous course in Chaucer.


640-41-42 Studies in Restoration and Eighteenth- Century Literature (3,3,3) Topics vary: Swift, satire, restoration literature, Johnson and Boswell, Addison and Steele, restoration drama, Dryden.

650 Studies in English Romanticism (3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus.

651-52 Studies in Victorian Literature (3,3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus.

660-61-62 Studies in American Literature (3,3,3) Southern literature before 1830, frontier, regionalism, American women's literature, Irving, Cooper, Poe, Emerson, Thoreau, Hawthorne, Melville, Whitman, Dickinson, James, and Twain.

670-71-72 Studies in Twentieth-Century Literature (3,3,3) Seminar content varies: particular literary figure or figures, genres, theme, or other coherent focus.

680 Topics in English Language (3) May be repeated with consent of director of graduate studies. Maximum 9 hrs.

682 Studies in Rhetoric and Composition (3) Content varies: Advanced work in theory and/or history of rhetoric and composition. Issues in invention, textuality, literacy, historiography, style and ethics.


686 Studies in Creative Writing (3) Content varies: Connection between theory and practice in writing.

688 Studies in Literary Criticism (3) Content varies: Advanced work in theory and history of literary criticism.

690 Special Topics (3) Content varies: History of ideas, humor, biography, autobiography, extra-literary disciplines.

694 Studies in Film (3) Content varies: Advanced work in film history and analyses.

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**Entomology and Plant Pathology**

(College of Agricultural Sciences and Natural Resources)

**MAJOR**

Entomology and Plant Pathology .......................... M.S.

Carroll J. Southards, Head

Professors:

Bernard, Ernest C., Ph.D. ............... Georgia Gerhardt, Reid R. (Liaison), Ph.D. ...... NC State

Hilly, James W., Ph.D. ................... Ohio State

Johnson, Leander F. (Emeritus), Ph.D. ...... Louisiana State

Lambdin, Paris L., Ph.D. .............. VPI

Pless, Charles D., Ph.D. ............. Clemson

Southard, Carroll J., Ph.D. ........... NC State

Associate Professors:

Grant, Jerome F., Ph.D. ........... Clemson

Gwinn, Kimberly D., Ph.D. ............ Clemson

Reddick, Bradford B., Ph.D. ......... Clemson

Windham, Mark T., Ph.D. .............. NC State

Assistant Professor:

Owley, Bonnie H., Ph.D. ................. NC State

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The Department of Entomology and Plant Pathology offers a graduate program leading to the Master of Science with a concentration in entomology or plant pathology. Students in entomology may specialize in crop entomology, medical and veterinary entomology, insect biology, insect pest management, or biological control. Students in plant pathology may specialize in fungal and stem fungus diseases, soil-borne diseases, plant pathology, and virology. For specific information, contact the department head.

**THE MASTER'S PROGRAM**

**Admission Requirements**

For admission to the M.S. degree program, a student must meet all requirements of The University of Tennessee Graduate School and must have completed (1) general botany or biology, 8 hours; (2) advanced biological sciences, 8 hours; (3) general inorganic and analytical chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

**Degree Requirements**

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of coursework for graduate credit, approved by the student's advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be passed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include at least 6 hours and not more than 10 hours of graduate-level credit in the minor department. The student's committee shall include a member of the faculty from the minor department to assist in designating courses required for the minor.

**GRADUATE COURSES**

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

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

510 Plant Disease Fungi (3) Morphology, taxonomy, 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: Introduction to 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. Pre
Environmental Engineering

See Civil Engineering

Environmental Practice

(College of Veterinary Medicine)

MAJOR  DEGREE

Veterinary Medicine  D.V.M.

L. N. D. Potgieter, Head

Professors:

Farkas, W. R., Ph.D.  Duke
Oliver, J. W., D.V.M., Ph.D.  Purdue
Potgieter, L. N. D., Ph.D.  Iowa State
Reed, C. F. (Emeritus), D.V.M.  Ohio State

Associate Professors:

New, J. C., D.V.M.  Texas A&M
Patton-McCook, S., Ph.D.  Kentucky
Reinemeyer, C., D.V.M., Ph.D.  Ohio State
Rohrbach, B. W., V.M.D.  Johns Hopkins
Schroeder, E. C., D.V.M.  Michigan State
Schultz, T., Ph.D.  Tennessee

Assistant Professors:

Frazier, D., D.V.M., Ph.D.  NC State

Hahn, K. A., D.V.M.  Purdue
Orozco, S., E., D.V.M., Ph.D.  Ohio State
Ramsey, E. C., D.V.M.  California (Davis)

Clinical Associate:

Clyde, V. L., D.V.M.  NC State

Post-Doctoral Research Associate:

Alansari, H. M., Ph.D.  Kansas State
Kania, S., Ph.D.  Florida
Keel, W. J., D.V.M., Ph.D.  Michigan State
Kennedy, M. A., D.V.M., Ph.D.  Tennessee

Pathologist:

Petersen, M. G., D.V.M.  Colorado State

See Veterinary Medicine for program description.

GRADUATE COURSES

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

501 Special Topics in Environmental Medicine (1-3) Aberrant metabolism, pharmacokinetics, toxicokinetics, epidemiology, and techniques in molecular biology: atomic absorption, gas chromatography, ultracentrifugation, extractive techniques and radioimmunoassay. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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


505 Laboratory Animal Care and Use (2) Review of basic laboratory animal care and use as prerequisite to conducting research using animal subjects. Compliance issues and techniques.

506 Experimental Animal Surgery (3) Competence in performing humane surgical modifications of experimental animals. Techniques of anesthesia. Drug administration and postoperative care. Prereq: Embryology, parasitology, physiology and/or consent of Instructor. 1 hr and 2 labs. F

530 Wildlife Diseases (2) Advanced study of virus diseases important to domestic animals: virus biology, pathogenesis, pathology and diagnosis technical training in virus diseases diagnosis. Prereq: Cellular and Comparative Biochemistry, and Advanced Topics in Biochemistry, Virology and Virology Lab, or Microbiology-Veterinary Medicine 811-812. 2 hrs and 1 lab. Sp.

561 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics properties of drugs: mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncracies and clinical applications. Prereq: Consent of Instructor.

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

607 Diagnosis and Pathogenesis of Virus Diseases of Domestic Animals (3) Advanced study of virus diseases important to domestic animals: virus biology, pathogenesis, pathology and diagnosis technical training in virus diseases diagnosis. Prereq: Cellular and Comparative Biochemistry. 2 hrs and 1 lab. Sp.

610 Advanced Topics in Environmental Medicine (1-3) Current and future research methodology, laboratory situation, recent advances in instrumentation and analytical techniques for environmental medicine. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs. E

Finance

(College of Business Administration)

MAJOR  DEGREES

Business Administration  MBA, Ph.D.

Harold A. Black, Head

Professors:

Black, Harold A. (James F. Smith, Jr., Prof.), Ph.D.  Ohio State
Dettman, William W. (Emeritus), Ph.D.  Ohio State
Philippatos, G. C. (Distinguished Prof.), Ph.D.  New York
Shrieve, Ronald E., Ph.D.  UCLA
Wansley, James W. (Clayton Chair of Excellence), Ph.D.  South Carolina

Associate Professors:

AUXLER, A. L., Ph.D.  Iowa
Boehm, T. P., Ph.D.  Washington (St. Louis)
DeGennaro, R. P., Ph.D.  Ohio State
Ehrhardt, M. C., Ph.D.  Georgia Tech
Wachowicz, J. M., Jr., CPA, Ph.D.  Illinois

Assistant Professors:

Collins, M. Cary, Ph.D.  Georgia
Davey, Phillip R., Ph.D.  North Carolina
Guntur, Deborah L., Ph.D.  Florida
Staehle, Michael B., Ph.D.  Virginia

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Finance.

The curriculum offers courses for those interested in careers in corporate financial management, security analysis and investments, banking and financial institutions, and real estate.

Minimum course requirements are three courses: Finance 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.

511 Contemporary Issues in Corporate Finance (3) Selected topics in financial management, recent developments that have significant impact on strategic issues in financial management. CAPT. budgeting, financial and ownership structure, dividend policy and corporate growth and control. Prereq: Business Administration 504 and 505 or consent of instructor.

512 Problems in Financial Management (3) Readings and cases that apply finance to real world investment, financing, and asset management problems. Prereq: Business Administration 504 and 505 or consent of instructor.
521 Investment Analysis (3) Principles and concepts of asset valuation in competitive and efficient financial markets. Basics of investment analysis of various securities. Prereq: Business Administration 504 and 505 or consent of instructor.

522 Portfolio Analysis and Management (3) Portfolio theory and evidence of behavior of security returns with view to determining rational investment policy. Statistical analysis of risk and return of portfolios, portfolio evaluation and revision, capital market theory, and extensions of portfolio analysis. Prereq: Business Administration 504 and 505 or consent of instructor.


532 Financial Institutions (3) Analysis of management policies of financial institutions; asset, liability and capital management. Legal, economic and regulatory environment and implications for management. Financial institution structure and competition and changing trends in U.S. financial system. Prereq: Business Administration 504 and 505 or consent of instructor.

551 Financial Management of a New Enterprise (3) Financial issues associated with formation, control, and long-term planning of new enterprise. Acquisition of venture capital. Prereq: Business Administration 504 and 505 or consent of instructor.

581 Real Estate Investment and Finance (3) Financial and market analysis used to make real estate investment decisions. Effects of variety of financing options on rate of return on income-producing properties. Effect of various financing options on consumer's decisions to purchase. Relationship between primary and secondary mortgage markets and impact of those markets on cost and availability of funds for real estate lending. Effects of government intervention (taxation, subsidization, and regulation) in both real estate and mortgage markets. Prereq: Business Administration 504 and 505 or consent of instructor.

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.

The Department of Food Science and Technology offers the Master of Science and Doctor of Philosophy degrees. Students in the doctoral program may choose research in the concentration 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 or letters of recommendation from at least 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 proposal. Registration for 6 hours of 500 level coursework is required.

2. In addition to the thesis requirement, a minimum of 24 semester hours of graduate coursework is required. This work must be approved by the student's committee and a minimum of 14 hours must be courses numbered above 500. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their Master's program. Completion of 510 or equivalent is also required.

4. An oral, final examination covering the thesis and coursework is required.

**Non-Thesis Option**

In lieu of a thesis, students are required to complete a problem in cooperation with their employer (company or governmental agency) and their faculty committee. Students working on a problem must register for 6 hours of 503.

2. In addition to the requirement for 6 hours of 503, a minimum of 24 semester hours of graduate coursework is required. This work must be approved by the student's committee and a minimum of 14 hours must be courses numbered above 500. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to take 2 hours of 501 Seminar in their program and are expected to attend this course and participate in discussions during their Master's program. Completion of 510 or equivalent is also required.

4. Students will be required to take a written comprehensive examination covering their coursework. In addition, an oral, final examination covering the problem and coursework is required. The oral examination will be held on the Knoxville campus.

**THE DOCTORAL PROGRAM**

1. Completion of a Master's degree in the field, or a closely related field, or passing a special qualifying examination is required for admission. Scores on the GRE aptitude test are also required.


3. A minimum of 72 hours beyond the Bachelor's degree, excluding credit for the Master's thesis, is required. Of this, 24 semester hours must be 600 Doctoral Research and Dissertation.

4. At least 24 hours of coursework numbered above 500 are required exclusive of doctoral research and dissertation. At least 6 of the 24 hours must be courses numbered above 600.

5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Science and Technology.

6. All candidates must complete 601 (2 hrs.) and are expected to attend 601 during their Ph.D. program.

7. Each candidate must pass both written and oral comprehensive examinations prior to admission to candidacy. Major professors will advise candidates on competencies expected. A final oral examination is required that includes a defense of the dissertation and subject matter that the student's committee considers appropriate.

**GRADUATE COURSES**

410 Food Chemistry I (3) Reactions of proteins, enzymes, and additives in foods. Physicochemical interactions of food materials. Prereq: Chemistry 110 or equivalent. 2 hrs. and 1 lab. F

411 Food Chemistry II (3) Reactions of inorganic compounds, carbohydrates, lipids and vitamins in foods. Prereq: Chemistry 110 or equivalent. 2 hrs. and 1 lab. Sp

420 Food Microbiology (2) Physical, chemical and environmental factors moderating growth and survival of foodborne microorganisms, pathogenic and spoilage microorganisms affecting quality of foods and their control. Prereq: Microbiology 210. Coreq: 429. F


430 Sensory Evaluation of Food (3) Principles and methods of sensory evaluation of foods. Prereq: Basic statistics, 2 hrs. and 1 lab. F

441 Preservation of Food (3) Prevention of deterioration and spoilage of foods. Methods of preservation. Prereq: Agricultural Engineering Technology 422. 2 hrs. and 1 lab. Sp

451 Dairy Products II (3) Science and technology of processing dairy products. Chemical, physical, and microbiological changes that occur during manufacture. Prereq: Principles of Chemistry, Introduction to Organic and Biochemistry, General Microbiology, 2 hrs. and 1 lab. F, A

460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, frozen and canned products. Effect of processing methods on product char-
Forestry, Wildlife and Fisheries

MAJORS

Food Science and Technology

DEGREES

M.S.

Wildlife and Fisheries Science

M.S.

George T. Weaver, Head

Professors:

Barrett, J. W. (Emeritus), Ph.D. .... Syracuse
Buckner, E. R., Ph.D. ....... NC State
Core, H. A. (Emeritus), Ph.D. .... Syracuse
Dimmick, R. W., Ph.D. ......... Wyoming
Hill, T. K., Ph.D. .............. Auburn
Little, R. L., Ph.D. ............. NC State
McGee, C. E. (Adjunct), D.F .... Duke
Ostermiller, D. M., Ph.D. ....... Duke
Pelton, M. R., Ph.D. ............ Georgia
Schneider, G., Ph.D. ............ Michigan State
Sharp, J. B. (Emeritus), D.P.A .... Harvard
Smailley, G. (Adjunct), Ph.D. .... Tennessee
Strange, R. J., Ph.D. ............ Oregon State
Stumbo, D. A., Ph.D. .......... Minnesota
Thor, E. (Emeritus), Ph.D. ....... NC State
Weaver, G. T. (Liaison), Ph.D. ..... Tennessee
Wilson, J. L., Ph.D. ............. Tennessee

Associate Professors:

Deardorff, B. L., Ph.D. .......... Colorado State
Hay, R. L., Ph.D. .......... Duke
Hopper, C. M., Ph.D. ........... VPI
King, M. M., Ph.D. ............ Utah State
Nodvin, S. C. (Adjunct), Ph.D. ... Cornell
Rennie, J. C., Ph.D. ........... NC State
Schlarbaum, S. E., Ph.D. ...... Colorado State
Smith, K. G. (Adjunct), Ph.D. .... Utah State
Wells, G. R., D.F. .......... Duke
Winston, J. P., Ph.D. .......... Iowa State

Assistant Professors:

Buehler, D. A., Ph.D. .......... VPI
Clark, J. D. (Adjunct), Ph.D. .......... VPI
Fly, J. H., Ph.D. ............ Michigan
Smith, E. R. (Adjunct), Ph.D. .... Tennessee
VanMiegroet, H. (Adjunct), Ph.D. .... Washington
WalDROP, T. A. (Adjunct), Ph.D. .... Tennessee

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 Science in Forestry 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 rating forms or letters of recommendation from three individuals familiar with the applicant's academic ability are required. The department also has an application that must be submitted at the time of application to The Graduate School.

Thesis Option

1. Prior to research for the thesis, the student is required to develop a detailed written research proposal. Registration for 6 hours of Thesis (Forestry 500 or Wildlife and Fisheries Science 500) is required.

2. A graduate committee of no fewer than 3 faculty members must be selected by the second semester of residence. At least one member shall be from outside the department. In addition to the thesis requirement, a minimum of 24 hours of graduate coursework is required. This work must be approved by the student's committee and no more than 10 hours of the minimum 30 can be below the 500 level. The committee may require additional coursework if the student's progress or background indicates such need.

3. All students are required to include Forestry 512 or Wildlife and Fisheries Science 512, Seminar, in their programs. This is required of each graduate student in residence fall semester.

4. An oral examination covering the thesis and coursework is required.

Non-Thesis Option (Forestry only)

1. Thirty-five hours of graduate coursework of which 23 must be at the 500 level or above is required.

2. A graduate committee of no fewer than 3 faculty members will be selected. At least one member shall be from outside the department. The committee will meet and schedule the student's program during the first semester in residence.

3. Three hours of Forestry 511 are required.

4. Nine hours of coursework in the department must be at the 500 level or above, exclusive of Forestry 511.

5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 28 hours of approved study.

A concentration in managing natural resource organizations is available under the non-thesis option with a major in Forestry. The minimum core requirements include: Forestry 511, 570, and six additional hours of Forestry courses to be selected in consultation with the student's committee. Political Science 564, Management 504, and Planning 560. Fourteen hours of elective coursework are selected with the faculty advisor.

Forestry

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 Wildland Recreation Planning and Management (3) Planning processes, master and site planning, site
433 Wood Composites and Gluing (3) Principles of adhesion; wood adhesives; fundamentals of plywood and composite panel manufacture. Evaluation resin properties; testing bond strength and durability. Prereq: 381 and 332, or consent of instructor. 2 hrs and 1 lab. F, A

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, problem formulation, problem diagnosis, and problem solutions. Management. Identify, analyze and prepare written report. Topic and report must have approval of graduate committee. Available only to students in nonthesis option for M.S. in Forestry, E

512 Seminar (1) Current developments in forestry. Required of all graduate students in residence 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: Graduate 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 planning tools, as applied to forest resource management. Prereq: Senior-level forest management or consent of instructor. F

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection of superior phenotypes; field testing for genetic variability; tree breeding; development of seed orchards; hybridization; tree cytology and tissue culture; use of genetic variation in forest management and conducting forest genetics research. Prereq: Silvicultural methods and Botany 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 in 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 investigation; current research trends in wildland recreation. Prereq: 321 or equivalent and statistics. F, A

560 Industrial Forestry I (3) Economic structure of forest products industries. Identification and analysis of industry structure and markets; domestic and foreign. Current trends and industrial structure: impacts on short term and strategic planning. Prereq: Senior-level forest management or consent of instructor. F, A

565 Industrial Forestry II (3) Evaluation of alternative strategies for firms in industry. Role of timber and timberland in integrated firm from standpoint of financial and strategic evaluations for different levels of self-sufficiency in sawmills, pulp mills and secondary processing facilities. Environmental, regulatory, labor and other financial and institutional arrangements affecting forest management and marketing strategies for private, industrial firms. Prereq: Senior-level forest management or consent of instructor. Sp,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: Senior-level administration and policy or consent of instructor. F, A

590 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analysis of 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, speculation, and polyploidy. Laboratory: normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq: Biology 220 and at least 6 additional hrs in biological sciences. (Same as Botany 581.) Sp,A

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory: fixed and variable plot sampling; list sampling; Poisson sampling; regression estimators; multistage and multiphase sampling. Growth and yield predictors for even-aged and uneven-aged stands. Prereq: senior standing in M.S. in Forestry. F, A

590 Advanced Topics in Forestry (1-3) Recent advances and concepts; research techniques and analysis of current problems. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs. E

593 Independent Study in Forestry (1-4) May be repeated. Maximum 6 hrs. E

## Forestry, Wildlife & Fisheries

### GRADUATE COURSES

410 Wildlife Habitat Evaluation and Management (3) Ecological relationships between wildlife and habitat. Evaluation, modeling, and management of wildlife habitat. Effects of land-use practices on wildlife habitat. Weekend field trips. Prereq: Introduction to Wildlife and Fisheries Management or General Ecology. 2 hrs and 1 lab. F

416 Planning and Management of Forest, Wildlife and Fisheries Resources (3) Integrated forest and wildlife resource management; management of land management plans and analyzing case studies including conflict resolution. Applicable to majors in Forestry and in Wildlife and Fisheries. Prereq: Senior standing 1 hr and 2 labs. Sp

525 Management of Forestry, Wildlife and Fisheries Resources (2) Current technologies and management strategies concerning wise use of forest, wildlife, and fisheries resources necessary for decision making and implementation. Prereq: 6 hrs of biological sciences or consent of instructor. Not available to students in forestry or wildlife and fisheries science. 4 hrs and 1 lab for six weeks. Sp

535 Environmental Impacts to Natural Ecosystems (3) Current environmental problems impacting natural ecosystems: climatic change, acid deposition, air pollution, species declines, and introduction of exotic species. Management methodologies to mitigate environmental problems. Prereq: Grad standing. F, A

540 Seminar on Integrated Resources Management in Biosphere Reserves (2) MAB program, UNESCO-endorsed global conservation initiative. Analysis of integrated resources management practices that demonstrate commitment to sustainable development. Environmental policy and application of science to management practice. Sp

541 Wildlife Techniques (2) Active and passive sampling techniques for fish and aquatic organisms; population estimation methods; fish handling and transport; food habits analysis; measuring and tagging techniques; age determination and incremental growth analysis; stream assessment; equipment and instrumentation usage and management; referral methods. Weekend field trip. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 1 hr and 1 lab or field. F

442 Fisheries Techniques (2) Active and passive sampling techniques for fish and aquatic organisms; population estimation methods; fish handling and transport; food habits analysis; measuring and tagging techniques; age determination and incremental growth analysis; stream assessment; equipment and instrumentation usage and management; referral methods. Weekend field trip. Prereq: Principles of Wildlife and Fisheries Management or consent of instructor. 1 hr and 1 lab or field. F

443 Fisheries Science (3) Quantification and management of freshwater fisheries: population estimation, age, growth, and biological assessment, and stocking. Prereq: Forestry, Wildlife and Fisheries Science 317 or Biology 230, and 6 hrs of mathematics. 2 hrs and 1 lab. Sp

444 Ecology and Management of Wild Mammals (3) Behavioral and ecological characteristics of game mammals and endangered mammals. Current principles and practices of wild mammal management. Prereq: Forestry and Wildlife 317 or Biology 230, 2 hrs and 1 lab. Sp

445 Ecology and Management of Wild Birds (3) Biological and ecological characteristics of game birds, endangered birds, and bird pests. Current principles and practices of wild bird management. Prereq: Forestry, Wildlife and Fisheries Science 317 or Biology 230, 2 hrs and 1 lab. Sp

490 Ethics in Wildlife and Fisheries Management (1) Ethical bases for decision-making and application of methodologies in practice of wildlife and fisheries management. Seminars by ethicists, wildlife and fisheries scientists and managers, and foresters to acquaint students with diverse perspective of ethical behavior in practices of wildlife and fisheries management. Lectures, panel discussions, and case studies. Team taught. Prereq: Senior standing. 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

512 Seminar in Wildlife and Fisheries Science (1) Current developments in wildlife and fisheries science. Required of all graduate students in residence in fall. May be repeated. Maximum 2 hrs. S/NC only. F

520 Planning and Administration of Fisheries and Wildlife Programs (2) Factors influencing policy and program planning activities of fisheries and wildlife agencies. Decision-making policies, case histories. Sp,A

525 Endangered Species Management and Conservation of Biodiversity (2) Status, ecology and management of endangered wildlife and plant species. Historic and current status of various ecological systems and surrounding recovery efforts. Approaches to monitor and manage for biodiversity. Prereq: Graduate standing or consent of instructor. Sp

530 Wildlife Diseases (2) Necropsy of birds and mammals, recognition of various diseases and disorders, preparation of pathological materials in field and lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr biology, 444 or 445, or consent of instructor. (Same as Environmental Practice 530) Sp,A

540 Predator Ecology (2) Dynamics of terrestrial vertebrate predator populations in human-altered and relatively unaltered environments. Prereq: 444 or 445 or consent of instructor. F, A

545 Population and Habitat Analysis (2) Detail characterization, assumptions, and current technologies for wildlife and fisheries science.
**Science (1-4) May be repeated. Maximum 6 hrs. E**

593 Independent Study in Wildlife and Fisheries
443, 444, 445, or consent of instructor. May be repeated.

560 Advanced Topics in Wildlife and Fisheries Sciences
fish species. Prereq: 443 or consent of instructor. 2 hrs.

555 Fish Culture (3) Principles, concepts and techniques of culturing economically important fish and shellfish species. Prereq: 443 or consent of instructor. 2 hrs.

**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
Foresta, Ronald, Ph.D. .............. Rutgers
Hammond, E. H. (Emeritus), Ph.D. .... California
Jumper, Sidney R. (Liaison), Ph.D. .... Tennessee
Long, Robert G. (Emeritus), Ph.D. .... Northwestern
Minkel, C. W., Ph.D. .............. Syracuse
Paludan, C. T. (UTSI), Ph.D. ........ Denver
Ralston, Bruce, Ph.D. .............. Northwestern
Schmude, Theodore H., Ph.D. .......... Wisconsin
Wilbanks, T. J. (Adjunct), Ph.D. ........ Syracuse

Associate Professors:

Blasing, T. J. (Adjunct), Ph.D. .......... Wisconsin
Brinkman, Leonard W., Jr., Ph.D. .... Wisconsin
Brown, Marilyn (Adjunct), Ph.D. ......... Ohio State
Pulsipher, Lydia, Ph.D. .......... Southern Illinois
Rehder, John B., Ph.D. .......... Louisiana State

Assistant Professors:

Harden, Carol P., Ph.D. .......... Colorado
Horn, Sally P., Ph.D. .......... California
Liu, Cheng (Adjunct), Ph.D. .......... Tennessee
McKown-Ice, Roslyn (Adjunct), Ph.D. .... Oregon

The department offers the Master of Science and Doctor of Philosophy degrees. The Master's degree emphasizes development of professional competence as a geographer and offers opportunities to gain substantial depth in a concentration or a major technique. An emphasis in geographic information systems is available for students who have appropriate backgrounds in mathematics and computer science. The doctoral program is for those who have demonstrated proficiency in conducting independent research. The department is particularly well-qualified to direct research in geography of the natural environment (biogeography, biological conservation, geomorphology, spatial analysis, particularly transportation and analysis location), Latin America, the American South, and urban geography. 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 504, 515, 599, 9 hours of 600-level seminars, and (at each offering during residency) 501. A minimum of 12 hours must be earned in related fields outside the department. Competence in 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 states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Geography is available to residents of the states of Alabama, Arkansas, Mississippi, South Carolina, Virginia, or West Virginia. The Master's program is also available to residents of Texas and Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

**GRADUATE COURSES**

411 Computer Mapping and Geographic Information Systems (3) Conception, management, and presentation of digital data for spatial analysis and cartographic data structures. Prereq: 310 and knowledge of computer language or consent of instructor. 2 hrs and 1 1/2-hr lab.

412 Cartographic (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, data, and societal data; use of interpretation and mapping techniques. Prereq: 310 or consent of instructor.

415 Quantitative Methods in Geography (3) Geographical application of statistical techniques; point pattern analysis; analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk culture, traditional material culture and rural settlement of residents, from eastern North America and selected foreign areas. Prereq: 101-02 or 320 or consent of instructor.

425 Plant Geography of North America (3) Characteristics and analysis of plant communities of Canada, the U.S., Mexico and Central America. Relations to climate, soil, fire, and human disturbance. Long-term history and future prospects. Prereq: Coursework in geography or botany or consent of instructor.

435 Biogeography (3) Changing distribution patterns of plants and animals on variety of spatial and temporal scales. Effects of continental drift, Pleistocene climatic change, and human activity on world biota. Prereq: Geography of the Natural Environment or consent of instructor.

436 Water Resources (3) Global water resources and hydrologic processes: water availability, flooding, and water quality issues from physical and economic geographical perspectives. Prereq: Geography of the Natural Environment or Meteorology or consent of instructor.

439 Climatology (3) General circulation systems leading to world pattern of climates, climatic change and modification, and interrelationships of climate and human activity. Prereq: Geography of the Natural Environment or Meteorology or consent of instructor.

441 Urban Geography (3) Concepts and theories concerning urbanization and location and significance of systems of cities and urban morphology of cities. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441.)

444 Rural Geography (3) Geographical appraisal of rural areas of the United States: small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor.

445 Geography of Resources (3) Study of factors related to variation in resource availability from time to time and place to place; economics and political resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examinations of transportation systems, their effects on trade patterns, land use, location, and environmental evolution. Prereq: 141 or 340 or consent of instructor.

505 Process Geomorphology (Same as Geology 450)

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.

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

504 Research Design (3) Geographical research from selection of topic and development of research design through field work and final report.

505 Directed Research (2-6) Research on problems as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.

506 Directed Readings (2-6) Readings on topics of interest as defined by individual students. Prereq: Written consent of instructor and department prior to registration. May be repeated with consent of instructor. Maximum 9 hrs. S/NC or letter grade.

509 Topics in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs. S/NC or letter grade.

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.

512 Topics in Cartographic Research (3) Trends, concepts, problems and methods in cartographic research. Prereq: 411 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

513 Topics in Remote Sensing (3) Applied research using imagery for interpretation and mapping of geographic data. Prereq: 413 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

515 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 415 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

517 Geographic Information Management and Processing (3) Concepts and methods in management of geographic information. Database design, manipulation, sampling and analysis. Prereq: Consent of instructor.

519 Graduate Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of department before registration. May be repeated with consent of instructor. Maximum 6 hrs.

520 Topics in Cultural Geography (3) Examination of trends, problems, and methods in cultural geography. Prereq: 411 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 system or in modern climatology. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

535 Topics in Biogeography (3) Examination of trends, problems, and methods in biogeography. Prereq: 435 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

536 Plant Communities and Plant Geography (4) (Same as Botany 536.)

541 Topics in Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 441 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

549 Topics in the Geography of Transportation (3) Examination of trends, problems, and methods in transportation geography and transportation networks. Prereq: 449 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

550 Regional Geomorphology (3) (Same as Geology 550.)

577 Biological Conservation (3) Analytical treatment of politics, policies, and forms of biological conservation as practiced in U.S. and abroad. Prereq: Consent of instructor.

591 Foreign Study (1-15) See page 32. Prereq: Written consent of department prior to registration. S/NC or letter grade.

592 Off-Campus Study (1-15) See page 32. Prereq: Written consent of department prior to registration. S/NC or letter grade.

593 Independent Study (1-15) See page 32. 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, space, problems, and methods of geography. Prereq: Consent of instructor.

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

609 Seminar in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

631 Seminar in Physical Geography (3) Prereq: 523 or consent of instructor. May be repeated. Maximum 6 hrs.

632 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.

642 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: 540 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:
Broadhead, Thomas W., Ph.D....................... Iowa Hatcher, Robert D., Jr. (Distinguished Scientist), Ph.D....................... Tennessee
Kopp, Otto C., Ph.D......................... Columbia Laboltka, Theodore G., Ph.D....................... Caltech
McLaughlin, Robert E. (Emeritus), Ph.D....................... Tennessee

Associate Professors:

Assistant Professors:
McKay, Larry D., Ph.D....................... Waterloo 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, an applicant must provide transcripts of previous university work, two rating forms or letters of recommendation, and GRE scores, including the subject exam in geography (or in another area if geography was not the area of previous university-level concentration). Students are not normally 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 written thesis and a minimum 3.0 GPA in all graduate coursework.

Course requirements are a minimum of 30 semester hours, including:
1. Six hours of Thesis 500.
2. Registration in 595 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. Sixteen hours of geology courses, with 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 prerequisite for the Ph.D. program, in addition to that for the M.S. program, is either a Master's degree in Geology, or a Bachelor's degree plus completion of 9 hours of coursework from the list in #3 above, including one course from each 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 beyond the Master's degree is required in addition to the 24 hours of Dissertation 600. The coursework includes the sum of 9 hours of 600-level geology courses, 9 hours of 500-level or higher geology courses, and 6 hours of additional graduate courses. Extra-departmental coursework is encouraged.

The student must demonstrate a reading knowledge of a foreign language in which there
is a body of geologic literature, as approved by the student's dissertation committee.

GRADUATE COURSES

401 Quantitative Methods in Geology (3) Applications of calculus and differential equations to problems in earth sciences. Example: Absorption of light in geology; wave equation in geophysics; mechanical modeling and boundary conditions in structural geology and tectonics. Prereq: The Dynamic Earth or Earth, Life, and Time, 2 semesters of Calculus.

410 Advanced Mineralogy (3) Crystal chemistry of rock-forming minerals and their determination by X-ray diffraction. Laboratory exercises emphasize thin section and X-ray diffraction methods of mineralogy. Prereq: 310; 2 hrs and 1 lab.

420 Paleocology (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 Phyla: Protista, Porifera, Cnidaria, Bryozoa, and Brachiopoda. Application of paleontology, skeletal structures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.

422 Invertebrate Paleontology II (3) Survey of higher invertebrates: Arthropoda and other worms, Mollusca, Echinodermata, Graptolites, Conodonts, Chordata. Functional morphology, skeletal structures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor. 2 hrs and 1 2-hr lab.

426 Paleobotany and Palynology (3) Evolutionary history of terrestrial plant life through examination of fossil record of macrobotanical remains, spores, and pollen grains. Origin and diversification of Gymnosperms and Angiosperms and adaptive responses in floristic provinces through geologic time. Prereq: 102; Botany 310-20 or consent of instructor. (Same as Botany 426.) 3 hrs and 1 lab.

440 Field Geology (6) Summer field course for advanced undergraduate geology majors and first-year graduate students in geology. Taught off-campus at Geology Field Station and requires full time of student. Synthesis of major aspects of geological sciences in societal context. Field techniques demonstrated, practiced, and applied to solution of geologic problems. Prereq: Completion of major core courses and consent of instructor.

445 Regional Geology of the United States (3) Evolutionary history of terrestrial plant life through examination of fossil record of macrobotanical remains, spores, and pollen grains. Origin and diversification of Gymnosperms and Angiosperms and adaptive responses in floristic provinces through geologic time. Prereq: 102; Botany 310-20 or consent of instructor. (Same as Botany 426.) 3 hrs and 1 lab.

450 Process Geomorphology (3) Integrative approach to development of surface of earth based upon case histories, maps, remote sensing imagery. Prereq: 101-02. (Same as Geography 450.) 2 hrs and 1 2-hr lab.

455 Basic Environmental Geology (3) Applications of geological sciences toward comprehension of effects of geological processes on humans and effects of human activities on earth's 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 understanding of geologic processes and their use in solving geologic problems. Crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in earth's crust. Prereq: Chemistry 120-30. Recommended prereq: 350; 2 hrs and 1 lab.

470 Applied Geophysics (3) Basic principles of geophysical exploration: applications to environmental problems. Seismic and electromagnetic methods. Prereq: 6 hours of geology courses numbered above 300, Elements of Physical Geology. 471 Fieldwork in Geophysics (2) Geophysical investigations applied to solution of problems in tectonics, hydrogeology, or environment. Summer field course off-campus. Prereq: 470; required for 2 or more weeks. Prereq: 470 or consent of instructor.

475 Physical and Chemical Systems of the Earth (3) Development of physical earth from solar nebula to present. Formation, composition and evolution of hydrosphere, crust, mantle, and core. Interdependence of earthquakes, vulcanism, plate tectonics, geomagnetism, chemical and isotopic processes of interior, and earth's temperature. Historical perspective on major controversies of past, and problems unresolved today. Prereq: 16 hrs of geology courses numbered 300 and above. 2 hrs and 1 discussion.

480 Principles of Economic Geology (4) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogenesis. Prereq: 310 and 330 or equivalents. Recommended prereq: 460. 1 hrs and 1 2-hr lab.

485 Principles of Geohydrology (3) Ground water flow, aquifer analysis, ground water contamination, and ground water management. Prereq: General Geology or equivalent or consent of instructor. General Chemistry or equivalent, and Calculus or equivalent. (Same as Civil Engineering 485.)

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

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

503 Structure of the Southern and Central Appalachian Highlands (2) Organization of Southern and Central Appalachians from extensional Late Proterozoic--early Paleozoic rift-drift-platform margin through processes related to compressional events producing accretary elements of Appalachian orogen. Comparison of island and its causes. 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 geological and paleontological data. 2 hrs and 1 seminar.

526 Biostatistics (3) Examination of principles of stratigraphy and biostratigraphy through selected case histories. 1 hr and 1 2-hr seminar.

530 Petrogenesis of Crystalline Rocks (4) Origin and properties of igneous and metamorphic rocks, magmatic and subsolidus processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. Prereq: 415; 3 hrs and 1 lab.

535 Ground Water Hydrology (3) (Same as Environmental Engineering 435.)

540 Seminar in Local Geology (1) Introduction of geology of Southern Appalachians. 1 hr plus fieldtrip.

545 Sandstone Petrology/Physical Sedimentology (4) Field and microscopic analysis of terrigenous clastic rock types: physical processes of sedimentation, transport of sediment, and formation of sedimentary structures. Prereq: 340 or equivalent. 3 hrs and 1 lab.

546 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonate sediments and diagenesis of resultant rocks; petrology of ore-gangue assemblages. Prereq: 340 or equivalent. 3 hrs and 1 lab.


551 Aqueous Geochemistry (3) Introduction to and applications of equilibrium thermodynamics to earth surface environments; geochemistry of natural water, weathering reactions, and early sediment diagenesis. Prereq: Chemistry 120-30. 3 hrs and 1 lab or seminar.


560 Geochemical Analysis (3) Collection and treatment of geochemical data using electron microprobe, X-ray fluorescence, and X-ray diffraction, and measurement of microproportion techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.

570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent developments. Prereq: 370 or equivalent, or consent of instructor. 3 hrs and 1 lab or seminar.

571 Regional Tectonics and Structural Geology (3) Major subdivisions of earth's crust and processes that form them. Comparison of internal structure of mountain chains and how they function in increasing continental crust. Examples from different parts of world. Prereq: Structural geology or consent of instructor.

572 Plate Tectonics and Cogeny (4) Tectonic development of geological belts from minor to major 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) Imaging subsurface features using reflected seismic waves. Energy sources, modes of wave propagation, field procedures, computer data processing, and pitfalls. Applications to tectonic and environmental problems. Prereq: 470 or consent of instructor.


580 Ore Petrology (3) Detailed study of selected ore deposits; petrology of ore-gangue assemblages. Prereq: 480 or consent of instructor. 2 hrs and 1 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 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

594 Field Problems in Geology (1-2) Literature study and seminars on specific regions of geologic interest, supplemented by extended field trips. 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 (3) May be repeated with consent of department. Maximum 5 hrs.

620 Seminar in Paleontology (3) May be repeated with consent of department. Maximum 9 hrs.
German and Slavic Languages
(College of Liberal Arts)

MAJORS DEGREES
German ........................................ M.A.
Modern Foreign Languages ................ Ph.D.

David E. Lee, Head

Professors:
Falen, James E., Ph.D. ................. Pennsylvania
Fiene, Donald M., Ph.D. ............... Indiana
Kratz, Henry (Emeritus), Ph.D. ........ Ohio State
Osborne, J. C. (Liaison), Ph.D. ........ Northwestern
Rice, Martin P., Ph.D. .................. Vanderbilt
Rittenhof, Ursula C. (Emeritus), Ph.D. .... Connecticut

Associate Professors:
Hodges, Carolyn R., Ph.D. .............. Chicago
Lauckner, Nancy A., Ph.D. ............. Wisconsin
Lee, David E., Ph.D. ..................... Stanford
Mellor, C. J., Ph.D. ...................... Chicago

Assistant Professor:
Moser, Beverly, Ph.D. ................. Georgetown

The Department of Germanic and Slavic Languages offers two advanced degrees: the Master of Arts in German and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department.

THE MASTER'S PROGRAM
The department requires a minimum of 30 semester hours including 15 hours of coursework 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 63 semester hours of coursework beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. Two tracks are available.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
   - A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); German 512 (3), French 512 (3), or Spanish 512 (3); French 515-18 (2-2.5) or German 550 (3).
   - At least 12 hours at the 600 level (exclusive of dissertation hours).

2. Second Concentration: French, German, Italian, Russian, or Spanish (different from the first concentration). It consists of at least 18 hours of courses beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.
   - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.

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 for both tracks: A student must demonstrate competence in the languages of both the first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI). If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination with translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language family.

A comprehensive examination on the language and literature of the first and second foreign languages must be passed before the student may be admitted to candidacy. The candidate is required to defend his/her dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct at least two foreign languages, subject to staffing needs. Doctoral students are strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g., Fulbright, McCrue, Rotary fellowships).

For additional courses, see Romance Languages.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Modern Foreign Languages is available to residents of the state of Alabama or Kentucky. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

German

GRADUATE COURSES
331-352 Elements of German for Upper-Division and Graduate Students (3-3) Elements of language, elementary and advanced readings, and a final 10,000 word translation project. Open to graduate students preparing for language examinations, and upper-division students desiring reading knowledge of the language. No credit for
students having completed 101-102 or 107. 332 may be repeated. Maximum 6 hrs. Undergraduate credit only.

411-12 Advanced Conversation and Composition (3,3) Prereq: 311-12 or equivalent or consent of department.

420 Selected Topics in German Literature from 1750 to the Present (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

421 German Lyric Poetry (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

422 German Drama (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

423 German Narrative Prose (3) Prereq: 6 hrs of 300-level courses (excluding 331-32 and courses in English translation) or equivalent.

424 German Literary Movements (3) Survey of major periods in development of German literature since 1750: problems and pitfalls of periodization.

425 Introduction to Descriptive Linguistics (3) (Same as French 425, Spanish 425, Linguistics 425, and Russian 425.)

426 Methods of Historical Linguistics (3) Phonetics, distinctive feature analysis, sound change types, nature of sound change, principles of reconstruction, and fundamental assumptions about language change through time. Survey of non-phonological linguistic changes, language families, Proto-Indo-European, and other proto languages. Prereq: 6 hrs of upper division foreign language courses (excluding courses in translation or graduate reading courses). (Same as Russian 426, French 426, Spanish 426, and Linguistics 426.)

433 Structure of the German Language (3) Contrastive English-German segmental and suprasegmental phonemes, contrastive English-Germanic linguistic structures, selected topics in advanced German grammar and syntactic analysis. Prereq: 6 hrs of upper division German language courses or graduate reading courses. (Same as Linguistics 430.)

436 History of the German Language (3) Development of German language from Indo-European through Proto-Germanic, Old High German, Middle High German to New High German. Internal and external linguistic history of German speech. Prereq: 6 hrs of upper division German language courses (excluding courses in translation or graduate reading courses). (Same as Linguistics 436.)

485 Business German (3) Survey of German used in fields of business, government, administration, and economics. Prereq: 6 hrs of upper division German excluding courses in translation and graduate courses.

500 Thesis (1-15) 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 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selected topics in German grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

512 Teaching a Foreign Language (3) Practical application of methods for teaching and evaluating basic language skills and cultural knowledge through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding GTAs, except those whose previous training or experience warrants excuse by department.

519 Bibliographical Methods (1) Bibliographical methods, major reference works and bibliographical problems in language and literature.

520 Proseminar (2) Advanced training in use of bibliographical and reference tools; illustrative problems; paper preparation.

541-42 Medieval German Language and Literature (3,3) 541—Introduction to Middle High German; 542—Readings in Medieval German Literature.

550 Studies in German Literature (3) Content varies. May be repeated. Maximum 6 hrs.

551 German Humanism, Reformation and Baroque (3) Content varies. May be repeated. Maximum 6 hrs.

552 German Enlightenment, Rococo, and Sturm und Drang (3) Content varies. May be repeated. 6 hrs.

553 German Classicism and Romanticism (3) Content varies. May be repeated. Maximum 6 hrs.

554 German Realism and Naturalism (3) Content varies. May be repeated. Maximum 6 hrs.

555 Modern German Literature 1890-1945 (3) Content varies. May be repeated. Maximum 6 hrs.

556 Modern German Literature 1945-Present (3) Content varies. May be repeated. Maximum 6 hrs.

550 German Literary Theory and Criticism (3)

561-62 Directed Readings in German Language and Literature (3,3)

571-72 Old Norse Language and Literature (3,3)

591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32. Letter grade or S/NC.

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

610 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible.

611 Old High German (3) Phonology, morphology, and syntax of Old High German. Representative readings.

612 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings.

621-22 Seminar in German Literature (3,3) May be repeated. Maximum 18 hrs.

631-32 Seminar in German and Germanic Philology (3,3)

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### Russian

#### GRADUATE COURSES

425 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Spanish 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as French 426, German 426, Spanish 426, and Linguistics 426.)

510 Russian Phonetics and Advanced Grammar (3) Phonetics, pronunciation, stylistics, and selected topics in Russian grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

520 Proseminar (3) Bibliography; methods; illustrative problems; preparation of papers.

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 32.

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### Health

Graduate programs are available 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.
593 Directed Independent Studies (1-3) Individual identification and study of health/wellness or health promotion/professional issues. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs. E

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

601 Internship/Research in Safety and Health (3-6) (Same as Safety 601.)

610 Critical Analysis of Writing and Research (3) Analysis of writing and research in health related areas. F

620 Advanced Research Techniques in Health (3) Advanced theory and techniques of research design and 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 as related to health and well-being 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.)

660 International Health (3) Study of quality of health, health promotion and health services in countries throughout world. (Same as Public Health 660.) Sp


Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentration areas are available: community health education, health planning/administration, and occupational/environmental health and safety. The M.P.H. program is accredited by the Council on Education for Public Health. A minor in statistics is available to interested M.P.H. students due to public health affiliation with the Intercollegiate Graduate Statistics Programs.

ADMISSION REQUIREMENTS

A statement of the applicant's educational and career goals and three rating forms are required. Appropriate forms are available from the department's program in Public Health. Preferential consideration for admission to degree status shall be given to those with a minimum undergraduate grade-point average of 2.8 and with at least one year of professional experience in a health-related occupation. No provisional students will be admitted. As a restricted program, non-degree admission requires departmental recommendation.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 38 semester hours of coursework, including 9 weeks of field practice. Field practice provides a full-time experience with an affiliated health agency or organization offering one or more health programs. Of importance, field practice allows the student to apply academic theories, concepts, and skills in an actual work setting. Students must complete all associate prerequisite courses and 21 semester hours of the curriculum with a minimum overall GPA of 3.0 prior to placement in the field.

As an alternative to field practice, preparation of a Master's essay may be used to fulfill the professional skills development component of the curriculum. Approval must be received from the Public Health Academic Program Committee and is contingent on consent of major advisor, formal written proposal by the student, and completion of an additional research methods course. Written guidelines stipulating expectations and eligibility criteria are available.

MINOR IN GERONTOLOGY

Graduate students in Public Health may pursue a specialized minor in gerontology. This interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.P.H. program in Public Health is available to residents of the states of Arkansas, Florida, Kentucky, Louisiana, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

COURSE REGISTRATION

Provisional graduate students are ineligible to enroll in 500-level public health courses. Non-degree students must obtain permission from department/program head to register for 500-level public health courses. Prerequisite coursework assigned as a condition of admission to the M.P.H. program must be completed promptly, with a grade of B or better, typically within the first semester or two of enrollment in graduate studies.

GRADUATE COURSES

400 Consumer Health (3) (Same as Health 400.)

410 Health in the Work Environment (3) Fundamental activities in field of industrial health aimed at reducing health problems for employees. Workplace health hazards and problems of concern to nurses, medical staff, management, engineers and others in industrial health and safety fields. Prereq: Consent of instructor. May not be taken for credit by occupational health concentration majors.

480 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs. 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

509 and Social Work 509.) S/NC only. F, Sp

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 not be used toward degree requirements. May be repeated. S/NC only. E

505 Continuing Education in Public Health (1-3) Selected learning activities and experiences in specialized areas of public health utilizing workshop format. May be repeated. Maximum 6 hrs. E

509 Graduate Seminar in Public Health (1) In-depth discussion of timely topics reflecting scope of public health as discipline and its interrelation with many other academic and professional disciplines. Speakers both internal and external. May be repeated. Maximum 4 hrs. (Same as Nutrition 509, Nursing 509, Physical Education 509 and Social Work 509.) S/NC only. F, Sp

510 Environmental and Occupational Health (2) Complexities of personal and ambient environment recognizing health as individual's response to diverse and dynamic world. Principles of occupational safety and health.
Survey of contemporary issues and their implications for healthful living today and in future. F, Sp

511 Fundamentals of Industrial Hygiene (3) Occupational health and safety; recognition, evaluation and control of workplace health hazards. Pertinent workplace problems and situations. Prereq: 2 yrs of chemistry and biology and consent of department. F


513 Industrial Hygiene Instrumentation and Sampling (3) Instruments and methods for evaluating industrial environment for personal exposure to chemical and physical stimuli affecting worker's health. Lecture, demonstration, and lab. Prereq: 511, MPH (CEHS) major, and consent of department. Sp

514 Industrial Toxicology and Occupational Exposures (3) Principles of industrial toxicology, basic toxic mechanisms, portals of entry, physiologic and biochemical responses. Occupational exposure assessment, physical factors and environmental conditions that influence exposure characterization, statistical aspects of sampling, chemical determinants into general environment. Prereq: 1 yr of general chemistry and 1 semester of human biology. Sp

520 Public Health Policy and Administration (3) Administrative considerations of community-based health care programs and practice; Health policy formulation, political environment and governmental involvement in health, legal responsibilities, and management concepts/techniques/practices. F, Su

521 Organization Theory and Health Care Delivery (3) Administrative and organization theory relating to health facilities; operation and management of community hospital. Case discussions and problem-solving exercises; managerial functions and skills. F

523 Management in Extended Care Settings (3) Management concepts and foundation essential to supervision and administration of domiciliary health service programs. Management and operation of health services programs for patients and clients in settings which provide activities of daily living and special psychosocial environmental needs. Programs for home health services, community mental health, nursing homes, congregate living centers and similar health programs. Prereq: 521 or consent of instructor. Sp

525 Financial Management of Health Programs (3) Financial management concepts and practices applied to health services programs. Fundamentals of budgeting, costing, financing, rate setting, financial reporting and control. Opportunities to apply techniques. Prereq: 520 or consent of instructor. Sp

530 Biostatistics (3) Application of descriptive and inferential statistical methods to health-related problems and programs. Microcomputer applications, use and interpretation of vital statistics and introductory research methodology preparatory for first course in epidemiology. Prereq: Introductory statistics or consent of instructor. F

540 Principles of Epidemiology (3) Distribution and determinants of health-related outcomes in specified populations. Principles for understanding and controlling health problems. Historical origins of discipline, hypothesis formulation, research design, data and error sources, measures of frequency and association, etiologic reasoning, disease screening, and injury control. Prereq or coreq: 530. F, Sp


550 Principles and Practices of Community Health Education (3) Theoretical foundations for contemporary health education; opportunities for skill development in variety of educational processes; and introduction to community health analysis. F

552 Community Health Problem Solving (4) Dynamics of community organization, community needs assessment, educational interventions, and application of program planning and evaluation techniques. Opportunity to practice skills in realistic setting. Prereq: 550 or consent of instructor. F

555 Health and Society (3) Understanding of social and behavioral factors which influence health status and care in America. Application to behavior in health-related organization. Social and psychological aspects of disease, sociological analysis of health care delivery systems, political economy of health and illness, impact of social movements on health, and social consequences of health legislation. Prereq: 550 or consent of instructor. Sp

560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems-oriented planning process. Major elements of planning: formulation and conceptualization of problem, plan design, evaluation and implementation. Health problems of institutions, communities and selected population groups, appropriate diagnoses, and programs for addressing needs. Sp

562 Group Processes in Health Planning (3) Application of group process techniques used in health planning. Tailoring group processes, leadership roles and techniques to encourage innovation and creativity in health planning groups. Sp

568 Physical Activity and Positive Health (3) Same as Physical Education 568.

569 Fitness Testing, Programming, and Leadership for Diverse Populations (2) Same as Physical Education 569.

580 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic, maximum 6 hrs.

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Human Performance and Sport Studies 585, Psychology 585, Social Work 585, and Sociology 585.)

587-88-89 Internship (3,3,3) Internship (community/public, private, commercial, and industrial settings. Survey of development and management of commercial goods and services offered in leisure market. Factors influencing participation, management considerations, and research in commercial recreation and tourism. Prereq: 110 or 110B, or consent of instructor. Sp

450 Specialized Study in Leisure Education (1-6) Special interest leisure activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to one's mental and physical health. May be repeated. Maximum 6 hrs. E

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

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

510 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today's society, scope of leisure services, determinants of leisure behavior, development of leisure services offered by public, private, and commercial entities. Organizational structures, personnel management, evaluation, legal authority, introduction to budgeting and fiscal procedures. Prereq: 310 or consent of instructor. F

515 Thematic Approaches to Conceptual Foundations of Leisure (3) Philosophical, historical, and social theoretical bases of leisure and recreation. Current trends, problems, laws, and issues affected by and/or affecting delivery of leisure services. Prereq: Consent of instructor. Sp

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of aspects of leisure delivery systems. Prereq: Consent of instructor. F

521 Facilitation Techniques in Therapeutic Recreation (3) Role of therapeutic recreation in clinical and non-clinical settings; application of life-style planning, self-awareness, values clarification and assertiveness training in therapeutic recreation, relationship of leisure education to therapeutic recreation. Prereq: 520 or consent of instructor. Sp

522 Clinical Aspects of Therapeutic Recreation (3) Clinical concepts and techniques utilized by experienced and advanced therapeutic recreation specialists: clinical issues, comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services. Prereq: 520. Su

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Revenue generating strategies, cash and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp

541 Management and Operation of Recreation and Sport Related Facilities (3) Research for making program and management decision, process of cost analysis, and budgeting of maintenance and recreation and sport related facilities. Prereq: Consent of instructor. Sp

Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional recreation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program with the department of Human Performance and Sport Studies.

The M.S., with thesis and non-thesis options, requires completion of 32 semester hours. The following retention policy applies to graduate students seeking the M.S. with a concentration in sport administration/management:

1. Graduate students are required to maintain an overall 3.0 GPA.
2. Any student who falls below this standard will be advised in writing by the department head of the need to discuss the matter with his/her advisor.

3. If a student's overall GPA remains below 3.0 for a second semester, the student will have his/her degree status revoked.

GRADUATE COURSES

410 Maintenance and Management of Recreation and Sport Related Facilities (3) Principles for operationalizing modern facility maintenance systems and management strategies. Cost tracking, inventory systems, maintenance budget formulation, 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 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, commercial, and industrial settings. Survey of development and management of commercial goods and services offered in leisure market. Factors influencing participation, management considerations, and research in commercial recreation and tourism. Prereq: 110, 310 or consent of instructor. F

450 Specialized Study in Leisure Education (1-6) Special interest leisure activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to one's mental and physical health. May be repeated. Maximum 6 hrs. E

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

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

510 Perspectives and Trends in Leisure Studies and Services (3) Basic role of leisure delivery systems in today's society, scope of leisure services, determinants of leisure behavior, development of leisure services offered by public, private, and commercial entities. Organizational structures, personnel management, evaluation, legal authority, introduction to budgeting and fiscal procedures. Prereq: 310 or consent of instructor. F

515 Thematic Approaches to Conceptual Foundations of Leisure (3) Philosophical, historical, and social theoretical bases of leisure and recreation. Current trends, problems, laws, and issues affected by and/or affecting delivery of leisure services. Prereq: Consent of instructor. Sp

520 Program Design and Evaluation in Therapeutic Recreation (3) History, philosophy, nature, purpose, special populations served, programming process, professional aspects of therapeutic recreation. Basic overview of aspects of leisure delivery systems. Prereq: Consent of instructor. F

521 Facilitation Techniques in Therapeutic Recreation (3) Role of therapeutic recreation in clinical and non-clinical settings; application of life-style planning, self-awareness, values clarification and assertiveness training in therapeutic recreation, relationship of leisure education to therapeutic recreation. Prereq: 520 or consent of instructor. Sp

522 Clinical Aspects of Therapeutic Recreation (3) Clinical concepts and techniques utilized by experienced and advanced therapeutic recreation specialists: clinical issues, comprehensive program concerns, administrative funding and trends in practice of therapeutic recreation services. Prereq: 520. Su

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Revenue generating strategies, cash and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp

541 Management and Operation of Recreation and Sport Related Facilities (3) Research for making program and management decision, process of cost analysis, and budgeting of maintenance and recreation and sport related facilities. Prereq: 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 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 non-drivers to drive. Valid driver’s license required. 3 hrs and 2 labs.

442 Advanced Driver & Traffic Safety Education (3) Development of competence in teaching of driver education through use of simulation, multimedia, and multiple-car driving range. Teaching skills and supervision. 2 hrs and 2 labs.

443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationships in sports injury and control; risk-taking and decision making strategy; and contributions of sports medicine to safety. 3 hrs and 2 labs.

452 General Safety (3) Principles, practices, and procedures in general safety. Safety problems in school, traffic, recreation, industry, home and other public areas. F, 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 used toward degree requirements. May be repeated. S/C 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. F

534 Organization, Administration and Supervision of Safety Programs (3) National, state and local level programs, administrative, instructional, and supervisory aspects. Implementation of relevant programs. Sp

535 Emergency Management (3) Civil and defense problems: tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries. Sp

572 Graduate Workshop in Safety (3) Special safety education problems. For advanced graduate students, teachers, supervisors, and administrators. May be repeated. Maximum 12 hrs.

590 Special Topics (1-3) Advanced study in selected disciplinary or professional area of safety education/management. May be repeated. Maximum 12 hrs.

601 Internship/Research in Safety and Health (3-6) Field experience. Significant problem identified, researched, and reported in acceptable form. May be repeated. Maximum 6 hrs. (Same as Health 601.) E

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.

History

(Majors of liberal arts)

History ........................................ M.A., Ph.D.
Russell Buhite, Head
Professors: Bargeron, Paul H., Ph.D. ................. Vanderbilt
Buhite, Russell, Ph.D. ........................ Michigan State
Chmielewski, Edward V., Ph.D. ............... Harvard
Cobb, James C., Ph.D. ........................ Georgia
Finger, John R., Ph.D. ............................ Washington
Grat, Leroy P. (Emeritus) (Distinguished Prof.), Ph.D. .......... Harvard
Haas, Arthur G., Ph.D. ........................ Chicago
Hao, Yen-Ping, Ph.D. ............................ Harvard
Haskins, Ralph W. (Emeritus), Ph.D. ..... California
Jackson, Charles O., Ph.D. ........................ Emory
Kleim, Milton M. (Emeritus) (Distinguished Prof.), Ph.D. ... Columbia
McDonald, Michael J., Ph.D. ............... Pennsylvania
Wheeler, W. Bruce, Ph.D. ........................ Virginia

Associate Professors: Becker, Susan D., Ph.D. ............... Case Western
Bing, J. Daniel, Ph.D. ............................ Indiana
Bohstedt, John, Ph.D. ............................. Harvard
Farris, W. Wayne, Ph.D. ........................ Harvard
Fleming, Cynthia G., Ph.D. ...................... Duke
Johnson, Charles W., Ph.D. ..................... Michigan
Muldow, John, Ph.D. ............................ Yale
Pinkney, Paul J., Ph.D. ........................... Vanderbilt
Utley, Jonathan G., Ph.D. ........................ Illinois

Assistant Professors: Brummett, Palma R. (Liaison), Ph.D. .... Chicago Burman, Thomas, Ph.D. ............... Toronto
Diacon, Todd A., Ph.D. ........................ Wisconsin
Gavitt, Philip R., Ph.D. .......................... Michigan
Plummer, Betty L., Ph.D. ........................ Maryland
Wakeman, Rosemary, Ph.D. ........................ California

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy degrees. The M.A. program includes a thesis and non-thesis option. The doctoral program has concentrations in American and European history with special focuses in the areas identified under group I, II, and III.

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

A total of 30 hours of coursework is required. At least 6 hours must be completed in each of two M.A. fields. The primary field is examined by a two-hour written examination followed within one week by a one-hour oral examination with the single grade of pass/fail given at the conclusion of the oral examination. No examination is given on the secondary field.

Non-Thesis Option

A total of 30 hours of coursework is required. At least 6 hours must be completed in each of two M.A. fields. The primary field is examined by a two-hour written examination followed within one week by a one-hour oral examination with the single grade of pass/fail given at the conclusion of the oral examination. No examination is given on the secondary field.

M.A. Fields

United States (colonial to present) Premodern Europe Modern Europe Asian History Latin America

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 following 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 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 24 hours of graduate coursework. (One must be completed at UT Knoxville.) Students who have completed a Master's thesis need complete only one research seminar (must be taken at UT Knoxville) and History 621.
7. Maintain a 3.0 overall grade-point average in graduate work attempted.
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 4-hours, written, and taken during the same semester. A general oral exam will be taken following the successful completion of the two written portions. The two written and one oral exams are separate examinations, and Group I must be passed before taking Group II, and the latter passed prior to taking the oral portion. A student who fails any part of the examination must repeat it no later than the following semester. A student will be allowed only one failure on the examination. A second failure, no matter on which part of the examination, will result in termination from the program. Upon successful 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:
1. Premodern Europe
2. Modern Europe
3. United States (colonial to present)
   East Asia

Group II:
To be defined by the student's doctoral committee from within one of the following fields:
1. Political (U.S.)
2. Socio-Economic
3. Military/International Relations
4. Regional/Local (U.S.)
5. 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 at this dissertation in its historical context. The program must be completed within eight years from admission as a potential candidate.

GRADUATE COURSES
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (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.
510 Foundations to Graduate Study In History (3) Assumptions and methods of historians. Required of all candidates for advanced degrees.
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 History (3) Reading seminar: secondary sources on 19th- and 20th-century United States history. 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 and economic influences 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 of the South. Focus varies. May be repeated. Maximum 15 hrs.
561 Topics in Latin American History (3) Reading seminar: secondary sources in Latin America. Focus varies. May be repeated. Maximum 15 hrs.
562 Topics in Asian History (3) Reading seminar: secondary sources on Asian history. East Asia and Middle East. Focus varies. May be repeated. Maximum 15 hrs.
571 Historical Editing (3) Seminar to develop practical skills applicable to historical editing.
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 32.
592 Off-Campus Study (1-15) See page 32.
593 Independent Study (1-15) See page 32.
600 Doctoral Research and Dissertation (3-15) P/NP only.
621 Directed Readings (3) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/NC only.
632 Seminar in Modern European History (3) Research seminar in primary sources culminating in scholarly paper in modern European history. Focus varies. May be repeated. Maximum 15 hrs.
641 Seminar in Early American History (3) Research seminar in primary sources culminating in scholarly paper in American history. Focus varies. May be repeated. Maximum 15 hrs.
651 Seminar in Military and Foreign Relations History (3) Research seminar in primary sources culminating in scholarly paper in military or foreign relations history. Focus varies. Not restricted by national grouping. May be repeated. Maximum 15 hrs.
656 Seminar in United States Regional and Local History (3) Seminar in primary sources culminating in scholarly paper in regional and local history. Focus varies. May be repeated. Maximum 15 hrs.
680 Seminar in History (3) Research seminar in primary sources culminating in scholarly paper in aspect of history not covered in another 600-level research seminar. Focus varies. May be repeated. Maximum 15 hrs.

Home Economics
(College of Human Ecology)

MAJOR

DEGREE

Home Economics........................................M.S.

The Master of Science with a major in Home Economics is a college-wide, multidisciplinary program. This degree provides a flexible graduate program for students wishing to pursue in-depth study across subject areas of home economics/human ecology. Teachers, extension personnel, family life educators and other professionals interested in broad-based areas will find that a diversity of subject matter combinations can be tailored to meet individual needs.
ADMISSION REQUIREMENTS
A completed file for review includes the Graduate School application file, College of Human Ecology application, Graduate Record Examination (GRE) scores for the general section or Miller's Analogy Test (MAT) score, and three Graduate School Rating Forms completed by individuals who can attest to the potential for graduate education. Forms may be obtained from the Dean's Office, College of Human Ecology. The M.S. in Home Economics requires an undergraduate degree in the field of home economics or human ecology.

THE MASTER'S PROGRAM
The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 6 hours in statistics and/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 comprehensive examination will be administered at the end of the program.

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

Home Economics Education
(College of Human Ecology)

Students pursuing graduate study in home economics education or extension are encouraged to enroll in the multidisciplinary Master's degree in Home Economics. Home Economics Education courses may be selected to meet requirements of that program. Home economics teachers may choose courses within this area for updating and certification renewal. Graduate coursework in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

GRADUATE COURSES

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor. F,Sp,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 of Home Economics in the Public Schools (3) Program planning, organization and administration of vocational home economics education. Supervision of pre-service and in-service home economics professionals. Prereq: Classroom teaching experience. Su,A

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;

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 90 hours including:
1. HEED 530.
2. HE 610.
3. HRA 532, ID 570 and RCS 550.
4. HRA 537 or RCS 590 or ID 590 (2 hours).
5. Minimum 9 hours of statistics and research methods.
7. Twenty-four hours of dissertation.
8. Electives for 34 hours approved by the committee. (Students must take at least 18 hours in one of three specialty areas: foodservice and lodging administration, retail and consumer sciences or interior design; including a minimum of 9 hours required at the 600 level.)

MINOR IN GERONTOLOGY
An interdepartmental/interdisciplinary minor in gerontology gives the graduate student an opportunity for combining the knowledge and experience about aging in American society with his/her own major concentration.

Core courses and a practicum are offered by the College of Social Work and selected departments within the colleges of Human Ecology, Education, and Liberal Arts. A cross-listed seminar between contributing programs is designed to integrate experiences from different sources and to demonstrate the multi-faceted nature of working within an aging society.

Declaration of a Minor
Prior to earning more than one-half the total hours required for this minor, students must complete a "Declaration of a Minor in the College of Human Ecology" form. Copies of this form are available in the Dean's Office, Room 110, Jesse Harris Building.

Core Experience
Students must complete a core experience of 12 semester hours taken from at least three different departments including nine hours taken from outside the major department. Coursework needs to comply with the following framework:
1. Coursework, 9 hours required. A variety of coursework may be taken toward satisfaction of this requirement. Courses which are offered on a regular basis include: Health 406, 468, Healthy

2. Applied practicum. 2 hours required. Students should register under practicum experiences in the "home" department of the supervising faculty.


4. Successful completion of a written comprehensive examination covering subject matter of the minor.

Graduate Committee
At least one faculty member from the Gerontology Policy Committee who is qualified to work with graduate students, must serve on the graduate committee of each student who declares a gerontology minor. Contact Dr. Jim Moran, Associate Dean in Human Ecology, for a current list.

Admission to Candidacy
When application is made for admission to candidacy, indication of the minor must be noted on the Admission to Candidacy form.

ACADEMIC COMMON MARKET
An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Human Ecology is available to residents of Alabama, Arkansas, Kentucky, Louisiana, Mississippi, South Carolina, Virginia or West Virginia. Additional information may be obtained from the 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 degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

510 Integrative Nature of Home Economics (3) History and philosophy of home economics. Analysis of current programs and future directions in field. Examination of research, integrative framework. F,A

520 Directed Study in Human Ecology (1-3) Integrative topics. Prereq: At least 9 hrs of graduate study in college including courses from at least two departments or consent of instructor. May be repeated. Maximum 6 hrs. E

525 Practicum in Home Economics (1-6) Field based experiences. Prereq: Consent of instructor. E

530 College Teaching in Human Ecology (3) Instructional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor. S

585 Seminar in Gerontology (1) Scope of gerontology as discipline and as related to other academic and professional disciplines. Speakers both internal and external to UTK. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. (Same as Educational and Counseling Psychology 585, Nursing 585, Human Performance and Sport Studies 585, Public Health 585, Psychology 585, Social Work 585, and Sociology 585.) S/NC only.


Human Performance and Sport Studies

(College of Education)

MAJORS

Human Performance and Sport Studies .................................. M.S., Ed.D. Education .................................................. Ph.D.

Joan Paul, Head
University Professor: Kozar, Andrew J., Ph.D. .................................. Michigan

Professors:
Capen, Edward K. (Emeritus), Ph.D. .................................. Iowa
Howley, Edward T., Ph.D. .................................. Wisconsin
Lay, Nancy E., Ph.D. .................................. Florida State
Li, Mead, B. J., Ph.D. .................................. Purdue
Paul, Joan (Liaison), Ed.D. .................................. Alabama
Phillips, Madge M. (Emeritus), Ph.D. .................................. Iowa
Watson, Helen B. (Emeritus), Ph.D. .................................. Michigan

Wrisberg, C. A., Ph.D. .................................. Michigan

Associate Professors:
Bettel, Patricia A., Ed.D. .................................. North Carolina (Greensboro)
DeSensi, J. T., Ed.D. .................................. North Carolina (Greensboro)

Jones, Ralph E., Ph.D. .................................. Minnesota

Namey, Thomas, M.D. .................................. Washington (St. Louis)

Assistant Professors:
Bassett, David R., Jr., Ph.D. .................................. Wisconsin
Boroviak, Patricia C., M.S. .................................. Tennessee
Kelley, D. R., Ed.D. .................................. Georgia State

Lewis, J. L., Ed.D. .................................. Tennessee

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

Track 1 - Concentrations are available in exercise science (adapted physical education, exercise physiology/fitness), motor behavior, pedagogy in physical education, sociocultural foundations (history, philosophy, sociology), and sport administration/management (an interdisciplinary concentration with health, Leisure and Safety). The thesis option requires a minimum of 30 hours. The non-thesis option requires 32 hours, including a project. All students must complete a course in research design or statistics and register for two credits of Human Performance and Sport Studies 601.

Track 2 - Requirements include Education 574, 2 hours; Education 575, 12 hours; Education 591, 4 hours; and specialty methods, 6 hours. Specialty methods courses must be approved by the graduate committee and include: one research or statistics course selected from 532, Educational & Counseling Psychology 520 or 521, and one pedagogy course selected from 511, 512, 514, 531, 533, 534, 541, 542, 543, 544, or 553. A Master's degree may be earned by taking 12 additional committee-approved hours from the above listed specialty methods courses for a total of 36 hours. A maximum of 6 hours may be taken outside of Human Performance and Sport Studies with the committee's approval. The thesis option requires 6 additional hours of Thesis 500 for a total of 42 hours.

THE DOCTORAL PROGRAM
The Doctor of Education with a major in Human Performance and Sport Studies is available with the following concentrations: Exercise science (adapted physical education, exercise physiology/fitness), Motor behavior, 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.

MINOR IN GERONTOLOGY
Graduate students in the Department of Human Performance and Sport Studies may pursue a specialized minor in gerontology. This interdisciplinary concentration allows the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. The minor is available to any graduate student in any discipline. The minor comprises 12 semester hours and consists of a core course in gerontology plus two additional courses from disciplines as related to aging. The total number of semester hours required for the minor is 12. The core course in gerontology is Human Ecology 585, 3 hours. The remaining 9 semester hours are elective courses from the humanities, social sciences, and professional disciplines. The minor is open to students enrolled in any graduate program.
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/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 nonthesis majors. Research study suitable for publication, or practicum requiring special written work. Prereq: 532.

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 if consent of instructor.

509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Nutrition 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: 432 or equivalent.

532 Seminar in Research Techniques in Physical Education (3) Evaluate, compare, and contrast research techniques in physical education with consideration for and experiences in appropriate review, design, and analysis procedures, and proposal development.

533 Psychology of Sport (3) Social psychological factors influencing human behavior in sport context; discussion of contemporary theory, research, and methodology. Prereq: General psychology course or consent of instructor.

534 Motor Behavior and Skill Acquisition (3) Topical explanation and application of principles of human movement behavior to acquisition and performance of skills; discussion of current research and methodology.

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 decisions, policy issues and research applications. Prereq: Consent of Instructor. (Same as Sociology 542.)

543 Human Motor Development (3) Changes in selected motor performance and related attributes during different 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 and sport within cultural context; research and field work.

553 Advanced Adapted Physical Education (2) Curriculum development and teach methodologies in programming for children with special education needs. Prereq: 411 or consent of instructor. Coreq: 554.

554 Advanced Adapted Physical Education Practice (3) Curricula and methodologies implemented in lab in school for handicapped. Coreq: 553.

555 Motor Assessment and Programming for the Child with Special Education Needs (3) Categorization and assessment in physical education with special physical education/motor development needs. Testing protocols which purport to get at basis of dysfunction; which tasks are best for and current symptoms of dysfunction; efficacy of remediation. Prereq: 563 and 565. May be repeated. Maximum 9 hrs.

561 Seminar in Exercise and Applied Physiology (1) Selected topics in exercise and environmental physiology. Prereq: 563 and 565. May be repeated with consent of instructor.

564 Research Participation in Applied Physiology (1) Participation in research with faculty member whose interests coincide with those of student. S/NC only.


569 Fitness Testing, Programming, and Leadership for Diverse Populations (2) Clinical experience in selecting, administering, and evaluating exercise tolerance tests on cycle ergometer and treadmill. Individual fitness programs for diverse populations. Practice in leading variety of activities aimed at improved fitness. Prereq: 480 and 414/415. Coreq: 569. (Same as Public Health 569.)

585 Seminar in Gerontology (1) (Same as Human Ecology 585, Educational and Counseling Psychology 585, Nursing 585, Psychology 585, Public Health 585, Social Work 585, and Sociology 585.)

593 Directed Independent Studies (1-3) May be repeated. Prereq: 532 or consent of instructor. S/NC or letter grade.

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

601 Research Seminar in Physical Education (1) Research topics in different aspects of physical education, sport, and human movement. May be repeated. S/NC only.

622 Directed Independent Research (3-6) Prereq: Doctoral student or consent of instructor. May be repeated. S/NC or letter grade.

633 Advanced Motor Behavior (3) In-depth analysis, synthesis, and discussion of contemporary theory and topics; research development and production: motor control, sport psychology, motor development. May be repeated. Maximum 9 hrs.

661 Seminar in Exercise and Applied Physiology (1) Selected topics in exercise and environmental physiology. Prereq: 563 and 565. May be repeated with consent of instructor.

664 Research Participation in Applied Physiology (1) Participation in research with faculty member whose interests coincide with those of student. S/NC only.

681 Practicum (1-3) Intern experience in areas of major interest. May be repeated.

Dance

GRADUATE COURSES

410 Ballet: Level III (2) Instruction and practice in advanced classical ballet techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

415 Teaching Creative Dance for Children (2) Theory, methods, and practical experience in presentation 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 rhythm notation; correlation with dance movement and composition. Prereq: Consent of instructor.

465 Dance Notation (3) Fundamentals of movement notation; notation and reading of elementary movement studies.

480 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.


495 Dance Pedagogy (3) Principles and methods of teaching dance with practical application in mini-teach-
Industrial and Organizational Psychology

(College of Business Administration and
College of Liberal Arts)

MAJOR

Industrial and Organizational Psychology

DEGREES

M.S., Ph.D.

Michael C. Rush (Liaison), Director

Committee:

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
Lounsbury, John W., Psychology
Russell, Joyce E. A., Management
Schumann, David W., Marketing, Logistics & Transportation
Stokely, Eric, Psychology

(For complete Faculty Listing, see Departments of Management and Psychology.)

The Master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research; for university teaching; and for consulting relationships with industry. The program emphasizes a scientist/practitioner model in applying and conducting research based on accepted theory, organizational behavior, psychology, management, and statistics. The programs are administered by a joint committee of the two departments, appointed by the Associate Vice Chancellor and Dean of The Graduate School on recommendations from the two department heads and the program director.

It is intended that students entering the I/O Program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses that will assist the students in attaining a reasonable level of sophistication in areas of deficiency.

ADMISSION REQUIREMENTS

Applicants for admission should request information and application forms from both The Graduate School and the Director, Industrial and Organizational Psychology Program, 408 Stokely Management Center, The University of Tennessee, Knoxville, TN 37996-0545.

Two separate applications must be completed: one application for admission to The Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology program. Deadline: now students are admitted in fall semester only, and applications must be received by the Graduate Admissions and Records Office by February 1.

General Requirements

At least one year of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade point average of 3.0 or above is required with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the general portion (verbal and quantitative) of the Graduate Record Examination (GRE) are required. Customarily, those students admitted to the program have performed at or above the 69-79th percentile on the general tests. (This corresponds to a raw score of approximately 600 on each of the tests.)

THE MASTER'S PROGRAM

A thesis is required with 6 semester hours of Management or Psychology 567-68. The Master's degree can be completed with a minimum of 33 semester hours in the major as follows:

Management 567, 568 or Psychology 517-18; Psychology 557; Statistics 537, 538.

Twelve hours of additional coursework to be selected primarily from the following with the approval of the student's advisor: Management 511, 522, 610; Management/Psychology 625, 626, 627, 638; Psychology 505, 550, 610, 620, 624.

Electives, as approved for an individual's plan of study, may be selected from graduate courses in psychology, social work, sociology, management, education, planning, etc. Students who wish to pursue special research interests aside from their thesis may register for Management 525, 526 (Maximum 6 hrs per term; courses may be repeated) or Management/Psychology 690.

An internship, practicum, or field experience is recommended. A student is expected to be in residence full time one year (two years recommended).

Doctoral candidates must pass a final oral examination on their dissertation research. In addition to course requirements, a doctoral student must attain a score of 650 (90th percentile) on the Subject GRE (Psychology-81) within two years of entry, successfully complete the qualifying examination covering scientific methodology before or during the third fall semester, and successfully complete the comprehensive examination in the areas of the student's major research and professional interests.

An overall B average is required in the course sequence Management 567-68 or Psychology 517-18 to continue in the program beyond the first year.

ACADEMIC COMMON MARKET

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

Industrial Engineering

(College of Engineering)

MAJOR

Industrial Engineering

DEGREE

M.S.

C. H. Alkens, Head

Professors:

Bontadelli, J. A., Ph.D. .......... Ohio State
Craycombe, W. W., PE, 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
LaForge, R. M. (Emeritus), PE, M.S. .......... Georgia Tech
Loveless, Howard L. (Emeritus), PE, M.S. .......... NC State
Schmidt, Harold W., Ph.D. .......... Texas
Snider, John N., PE, Ph.D. ......... Ohio State
Associate Professors:
Aikens, C. H. (Liaison), PE, Ph. D. .... Tennessee
Jackson, D. F., PE, Ph.D. ......... VPI
Professor:
Hungerford, J. C., Ph.D. ......... Ohio State
Assistant Professors:
Chatterjee, S., PE, Ph.D. .......... VPI
Goodman, Marvin K. (Emeritus), PE, Ph.D. ......... Tennessee
Sawley, Ruply S., Ph.D. .......... Tennessee
Lecturer:
Fortney, W. B., M.S. .......... Purdue

THE DEPARTMENT OF INDUSTRIAL ENGINEERING

The Department of Industrial Engineering offers a graduate program leading to the Master of Science degree with major in Industrial Engineering, concentrations in traditional industrial engineering and engineering management. The Ph.D. with a major in Engineering Science is available through the Department of Engineering Science and Mechanics with a specialization in industrial engineering.

THE MASTER’S PROGRAM

Students who enroll in the Master of Science degree may select a concentration in either industrial engineering or engineering management. Admission is open to graduates of ABET-accredited undergraduate curricula in engineer- ing, or to graduates of other technical curricula who satisfy prerequisites depending on their academic backgrounds and industrial experiences. Policies concerning prerequisite requirements will be determined by the Industrial Engineering faculty.

Industrial Engineering

Under the industrial engineering concentration, students may select either the thesis or the non-thesis option. The thesis option requires 24 hours of coursework and 6 hours of thesis. The non-thesis option requires 30 hours of coursework plus a 3-hour industrial design project.

Depending upon a student’s background and career objectives, graduate work in industrial engineering enables the student to select an area of specialization from operations research, manufacturing systems, human factors engineering, information systems, quality engineering, or general industrial engineering. It is also possible for a student to select minors in engineering, mathematics, psychology, business, computer science, statistics, or economics.

Industrial Engineering

The engineering management concentration has an additional admission requirement of two years’ industrial experience as a practicing engineer or scientist, or current full-time employment in an appropriate engineering or applied science position. The program is non-thesis and requires 33 hours of coursework plus a 3-hour capstone project. This concentration is fully supported off-campus utilizing electronic media for video taping and interactive distance teaching methods.

Note: Any 400-level course required in the Bachelor of Science in Industrial Engineering program at UT Knoxville may not be used for graduate credit in the M.S. degree program.

Industrial Engineering

GRADUATE COURSES


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, banks, industry. Prereq: 302, 401.

405 Engineering Economy (3) Problems and methods in selection or replacement of equipment. Decisions among engineering alternatives involving capital recovery, economic life of equipment, and rate of return on investment.


412 Quantitative Methods in Project Management (2) Project planning, scheduling, and control based on network and precedence diagramming methods. Resource allocation and time/cost trade-off algorithms, multi-project control, computer applications, and PERT methods of handling uncertainty in activity time estimates.

413 Research Methods in Industrial Engineering (3) Methods to collect and analyze data. Process control, statistical modeling of processes, behavioral sampling, single subject experimental designs, classical experimental design methods, and time series models of experiments. Validity and reliability concepts as related to measurement and collection of data. Strategies to control rival hypotheses: randomization, matching, blocking, factorial design, and related topics. Prereq: 300 and senior standing, Statistics 251.


422 Senior Industrial Engineering Problems Analysis (3) Application of industrial engineering to field assignments in local organizations, problem definitions, analysis and presentation. Prereq: 402, 403, and 405.


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

501 Design Project (1-3) Enrollment limited to engineering students in non-thesis option. May be repeated. Maximum 6 hrs. SNC only.

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


511 Facilities Planning and Design (3) Modern material handling techniques, computer-aided layout techniques, application of operation research models, and use of these to design manufacturing facility. Prereq: Project planning and scheduling. Prereq: Computer usage.

514 Information Systems II (3) Systems analysis and systems control concepts applied to systems of information. Role of IE in office and factory of future. Management support systems, decision support systems, and integrated enterprise support systems.

515 Production and Inventory Systems (3) Application of OR techniques to production and inventory systems. Deterministic and stochastic inventory models. Use of mathematical programming for product mix, process selection, facility planning and aggregate production planning problems. Application of simple and complex queuing models in manufacturing environment.

516 Statistical Methods in Industrial Engineering (3) Design and analysis of experiments. Methods and techniques used in the analysis and interpretation of data generated by industrial engineering projects. Prereq: Probability and statistics for scientists and engineers. (Same as Engineering Management 516.)

517 Reliability Engineering (3) Continuous time random processes with applications to availability of equipment and manufacturing systems. Failure densities and failure data analysis. Maintainability. Reliability-based criteria for product acceptance. Prereq: Probability and statistics for scientists and engineers. (Same as Engineering Management 517.)

518 Advanced Engineering Economy (3) Financing and investment functions of firm; deterministic analysis of after-tax cash flow projections; separation theorem and basic horizon models; stochastic analysis of capital budgeting problems; Monte Carlo simulation techniques; multiple attribute decision analysis. Prereq: Statistics and engineering economy. (Same as Engineering Management 518.)


521 Human Factors Engineering Methodology (3) Background in methodology used by human factors engineering designer and systems analyst. Observational methods, functional task analysis, design aiding techniques, computerized methods, human reliability and human error prediction, training analysis, evaluation of man-machine interface, subjective and objective techniques, scaling techniques, questionnaire and survey design, critical incident technique, consensus techniques (Delphi), accident investigation behavioral instrumentation, performance measurement, statistical techniques in experimental design, and expert systems. Prereq: 520.

522 Optimization Methods in Industrial Engineering (3) Classical optimization theory, unidimensional and N-dimensional search techniques, Lagrangean relaxation, separable programming, linearization techniques, quadratic programming, and dynamic programming. Prereq: 301 or 537.

523 Linear Programming and Extensions (3) Simplex and revised simplex methods, duality, parametric and post-optimality analysis, use of LP software integer programming techniques, brand and bound and cutting planes, network programming. Prereq: 301 or 537.

525 Air Traffic Control System (3) Current systems of air traffic control. Stochastic systems and air traffic design, critical incident technique, consensus techniques, scaling techniques, questionnaire and survey of man-machine interface, subjective and objective techniques, computerized methods, human reliability analysis, work measurement, incentive systems, techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, facility layout, linear programming, and applied operations research techniques. Not for credit for students with undergraduate degrees in industrial engineering. Prereq: 522, 523.


591-92-93 Special Topics in Industrial Engineering (3,3,3) Individual or group research projects. Prereq: Consent of Instructor. May be repeated.

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attribute decision analysis; Bayesian analysis of sequential decision making; artificial intelligence in complex decision analysis. Prereq: 519, 522.


604 Advanced Topics in Optimization (3) Multi-stage optimization theory. State increment dynamic programming and adaptive optimization theory. Prereq: 503.


609-92-93 Advanced Topics in Industrial Engineering (3,3,3) Forum to study individually or in groups. Prereq: Graduate standing and consent of instructor. May be repeated with consent of instructor.

518 Advanced Engineering Economy (3) (Same as Industrial Engineering 518.)

531 Motivational Theories and Systems in Various Organization Structures (3) Motivational theories in technology-based organizations. Impact of various organizational structures in relation to organization. Use and effectiveness of contemporary organizational systems.

532 Productivity and Quality Engineering (3) Productivity and quality measures defined and used to analyze current performance, performance improvement, reinvestment of important sectors of American industry with respect to national and international competition. Study of management theorists and systems which promote or inhibit productivity or quality improvements.

533 Theory and Practice of Engineering Management (3) Comparison of classical management principles and theory with environment, goals, and practices of engineering firms, research and development, and other scientific-engineering organizations. Cases to illustrate contemporary problems and environments.


535 Management of Technology (3) Challenges to implementing advanced technology, equipment, systems, methods in businesses and manufacturing organizations: justifying technology, assimilating change, changing management roles, personnel practices and organizational structure, and dealing with impact of new technologies on business policies and strategic planning.

536 Project Management (3) Management and control of multifaceted engineering and technological projects. Coordination and interactions between client and various service organizations. Selection of project manager and progress and management, typical problems associated with various phases of project cycle. Case studies on theories and concepts.

537 Quantitative Methods in Management (3) Survey of management analysis and control systems through IE techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, facility layout, linear programming, and applied operations research techniques. Not for credit for students with undergraduate degrees in industrial engineering.

538 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation. Cost and location studies and market analysis to determine commercial feasibility of new ventures.


541 Foundations of Total Quality Management (3) Basic understanding of TQM in context of fundamental building blocks of effective management: measurement, problem solving, continuous improvement, teamwork, customer focus, and supportive culture.


543 Productivity and Quality Engineering (3) Productivity and quality measures defined and used to analyze current performance, performance improvement, reinvestment of important sectors of American industry with respect to national and international competition. Study of management theorists and systems which promote or inhibit productivity or quality improvements.


535 Management of Technology (3) Challenges to implementing advanced technology, equipment, systems, methods in businesses and manufacturing organizations: justifying technology, assimilating change, changing management roles, personnel practices and organizational structure, and dealing with impact of new technologies on business policies and strategic planning.

536 Project Management (3) Management and control of multifaceted engineering and technological projects. Coordination and interactions between client and various service organizations. Selection of project manager and progress and management, typical problems associated with various phases of project cycle. Case studies on theories and concepts.

537 Quantitative Methods in Management (3) Survey of management analysis and control systems through IE techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, facility layout, linear programming, and applied operations research techniques. Not for credit for students with undergraduate degrees in industrial engineering.

538 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of manufacturing or service enterprise. Organizational and financial planning and evaluation. Cost and location studies and market analysis to determine commercial feasibility of new ventures.


541 Foundations of Total Quality Management (3) Basic understanding of TQM in context of fundamental building blocks of effective management: measurement, problem solving, continuous improvement, teamwork, customer focus, and supportive culture.

Interdisciplinary Programs

The College of Liberal Arts offers a series of interdisciplinary undergraduate majors and minors through its Interdisciplinary Programs.

African and African-American Studies

GRADUATE COURSES

421 Comparative Studies in African and Afro-American Societies (3) Education, religion, and social stratification. Views Afro-Americans and Africans have of each other and concept of Pan-Africanism.

450 Issues and Topics in Afro-American Studies (3) Problems, topics, issues, and individuals. May be repeated. Maximum 6 hrs.

452 Black African Politics (3) (Same as Political Science 452.)

461 African Prehistory (3) (Same as Anthropology 461.)


483 Afro-American Women in American Society (3) Historical and contemporary socio-eco-political factors in American society as related to Black women. (Same as Women's Studies 483.)

Asian Studies

GRADUATE COURSES

451 Readings in Japanese Literature (3) Prereq: Mastery of intermediate-level Japanese or consent of instructor. May be repeated. Maximum 9 hrs.

Cinema Studies

GRADUATE COURSES

420 French Cinema (3) (Same as French 420.)

421 Topics in Italian Literature and Cinema (3) (Same as Italian 421.)

489 Special Topics in Film (3) (Same as English 489.)

Comparative Literature

GRADUATE COURSES

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

Latin American Studies

GRADUATE COURSES

401 Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral patterns, political parties, role of military, church, educational institutions, dictatorship and nationalism.
402 Latin American Studies Seminar (3) Selected topics. May be repeated. Maximum 6 hrs.

**Linguistics**

**GRADUATE COURSES**

400 Topics in Linguistics (3) Content varies. May be repeated. Maximum 6 hrs.

411 Linguistic Anthropology (3) (Same as Anthropology 411.)

420 The Development of Historical Linguistics as a Science (3) Scientific understanding of language change. Impact of neogrammarian paradigm from 19th-century intellectual trends. Trends of synchronic, descriptive, structural and transformational-generative linguistics on contemporary diachronic theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

425 Introduction to Descriptive Linguistics (3) (Same as French 425, German 425, Russian 425, and Spanish 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, French 426, Russian 426, and Spanish 426.)

429 Romance Linguistics (3) (Same as French 429 and Spanish 429.)

430 The Development of Synchronic Linguistics as a Science (3) Development of first synchronic paradigm of linguistics. Impact of social sciences on American descriptiveists. Prerequisite: School. Transformational-generative theory. Prereq: 6 hrs of courses required for linguistics concentration or consent of instructor.

435 Structure of the German Language (3) (Same as German 435.)

436 History of the German Language (3) (Same as German 436.)

471 Sociolinguistics (3) (Same as English 471 and Sociology 471.)

472 American English (3) (Same as English 472.)

474 Teaching English as a Second or Foreign Language I (3) (Same as English 474.)

475 Teaching English as a Second or Foreign Language II (3) (Same as English 475.)

485 Special Topics in Language (3) (Same as English 485.)

**Urban Studies**

**GRADUATE COURSES**

401 The City in the U.S. (3) (Same as Planning 401.)

441 Urban Geography (3) (Same as Geography 441.)

464 Urban Ecology (3) (Same as Sociology 464.)

**Women's Studies**

**GRADUATE COURSES**

400 Topics in Women's Studies (3) Content varies. May be repeated. Maximum 6 hrs.

422 Women Writers in Britain (3) (Same as English 422.)

425 Women's Health (3) (Same as Health 425.)

434 Psychology of Gender (3) (Same as Psychology 434.)

466 Rhetoric of the Woman's Rights Movement to 1930 (3) (Same as Speech Communication 466.)

476 Rhetoric of the Contemporary Feminist Movement (3) (Same as Speech Communication 476.)

**Journalism**

(College of Communications)

**MAJOR**

**DEGREES**

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

James A. Crook, Director

Professors:

Adamson, June N. (Emeritus), M.S., Tennessee
Ashdown, Paul G., Ph.D. .................. Bowling Green
Crock, James A., Ph.D. ................. Iowa State
Everett, George A., Ph.D. ............... Iowa
Leiter, B. Kelly (Emeritus), Ph.D. .... Southern Illinois
Littmann, Mark, Ph.D. .................... Northwestern
Muller, M., Ph.D. ......................... Michigan State
Singletary, Michael W., Ph.D. ......... Southern Illinois

Associate Professors:

Bowles, Dorothy, Ph.D. .............. Wisconsin
Caudill, C. Edward, Ph.D. .......... North Carolina
Heller, Robert B., M.A. .......... Syracuse
Morrow, Jerry L., Ph.D. .............. Toledo
Puett, Sammie Lynn, M.S. ...... Tennessee

Assistant Professors:

Foley, Daniel, M.S. ........... Northwestern
Lucarelli, Susan M., Ph.D. .... Tennessee

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

**GRADUATE COURSES**

403 International Communications (3) Development and operations of world mass communications channels and agencies. Comparative analysis of media, media practices, and flow of news throughout world. Prereq: 470 or consent of instructor. May be repeated. Maximum 6 hrs.

412 Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines, and company publications, editorial devices and use of logic. Prereq: Communications 200, or consent of instructor.

414 Magazine Article Writing (3) Techniques of writing in-depth articles of mass circulation and specialized magazines. Organizing and presenting material, problems in specialized areas: business, science, agriculture, humanities. Prereq: Communications 200, or consent of instructor.


420 Print Media Management (3) Current business practice among print news media, especially newspapers. Problems in management and production and outlook for new technologies. Prereq: 6 hrs mathematics and/or accounting and senior standing. Sp

430 Public Affairs Reporting (3) Reporting and writing about courts, government, and public agencies. Writing and interviewing of experts in environmental science and policy. Exemplary popular literature in environmental reporting. Prereq: Editing for majors; consent of instructor for non-majors.

435 Issues in Science Communications (3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

451 Environmental Reporting (3) Writing articles on environmental issues such as air, water, pollution, and solid wastes. Mass media's role in environmental science and policy. Exemplary popular literature in environmental reporting. Prereq: Editing for majors; consent of instructor for non-majors.

460 Mass Communications History (3) Development of press and role of mass communications in American history. Prereq: 360. Sp

470 Public Relations Campaigns (3) Research, planning, and organizing a public relations campaign. Oral and written presentation of public relations project from inception to completion. Extensive out-of-class work. Prereq: Public Relations Principles. Sp

480 Journalism in the High School (3) Functions and management of high school publications. Problems related to staff selection, content of publications, copy, layout, photography, printing, advertising, and business. Prereq: Course outlines and curricula for journalism/mass media studies. Sp

516 Seminar in Journalism Issues (3) Topics vary. May be repeated. Maximum 6 hrs.

520 Press-Government Relations (3) Development of political relationships between journalists and government officials. Prereq: 360. Prereq: Staff positions in journalism or editing interests: agriculture, politics, labor, finance, science; technical, general publications. Prereq: 200 or consent of instructor. Sp

525 Public Opinion (3) Role of press in developing and interpreting public opinion. Social theories of public opinion and analysis of mass media's role in public opinion. Prereq: 200 or consent of instructor. Sp

535 Publications Management (3) Problems in management, production, research, and new technology in the mass communications profession. Prereq: 200 or consent of instructor. Sp

550 Writing and Editing Projects (3) Specialized writing or editing interests: agriculture, politics, labor, finance, science; technical, general publications. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

571 Seminar in Public Relations (3) Analysis and management of problems in communication between institutions and organizations and their publics. Measurement and evaluation of effectiveness of communication programs. Prereq: 470 or consent of instructor. Sp

580 Seminar in Visual Communication (3) Behavioral aspects of visual communication with emphasis on imagery, frames, and other design elements. Prereq: 200 or 350 or Broadcasting 430 or equivalent.

590 Communications and International Development (3) Relationship between mass communications and
Law

(Catalog of College)

MAJOR DEGREES

Law J.D., J.D.-MBA, J.D.-M.P.A.

Richard S. Wirtz, Dean

Professors:

Best, Reba, M.L.S. Florida
Cohen, Neil P., LL.M. Harvard
Cook, Joseph G., LL.M. Yale
Dessem, Lawrence, J.D. Harvard
Gray, R. Macdonald (Emeritus), Duke
Hess, Amy M., J.D. Virginia
Jones, Durward S. (Emeritus), J.D. North Carolina
King, Joseph H., J.D. Pennsylvania
Lacey, Forrest W. (Emeritus), S.J.D. Michigan
Le 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
Piquet, Cheryn, M.L.S. Tennessee
Rivkin, Dean H., J.D. Vanderbilt
Sebert, John A., J.D. Michigan
Sewell, Toxey H. (Emeritus), L.L.M. George Washington
Sobieski, John L., J.D. Michigan
Wirtz, Richard S., J.D. Stanford

Associate Professors:

Anderson, Gary L., LL.M. Harvard
Asnley, Frances Lee, LL.M. Harvard
Beineman, William J., J.D. Miami
Black, Jerry P., Jr., J.D. Vanderbilt
Burker, Mary Garrett, J.D. George Washington
Cornett, Judy M., J.D. Tennessee
Davies, Thomas Y., J.D. Northwestern
Gray, Grayford B., J.D. Vanderbilt
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
Wertheimer, Barry M., J.D. Duke

Assistant Professor:

Thorpe, Steven R., J.D. Mercer

Instructors:

Hoover, Mary Jo, J.D. Brookyn
Moore, Jean, M.A.L.S. Michigan
Wimberly, Phyllis, J.D. Alabama

The College of Law offers the Doctor of Jurisprudence degree program and a dual program with the College of Business Administration leading to the J.D. and the Master of Business Administration degree. In addition, graduate students may be eligible to take a limited number of law courses to count toward a graduate degree.

Current information regarding admission, financial aid, course requirements, academic policies, extracurricular activities, and student services is available in the College of Law Bulletin from the Admissions Office, The University of Tennessee, College of Law, 1505 West Cumberland Avenue, Knoxville, Tennessee 37996-1800. 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. A grade of 0.9 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.

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. A grade of 0.9 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 completed separately.

Admissions

Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, both the College of Business Administration and the College of Law. Students must satisfy all College of Business Administration and College of Law requirements as stated in the front section of this catalog as well as the requirements for this college.

Non-Law Elective Course Credit

Students enrolled in the J.D.-MBA 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.

Note: Students are advised to consult The Graduate School’s degree requirements as stated in the front section of this catalog as well as the requirements for this college.

DUAL J.D.-M.P.A. PROGRAM

The College of Law and the Department of Political Science in the College of Liberal Arts offer a coordinated dual degree program leading to the conferral of both the Doctor of Jurisprudence and Master of Public Administration degrees. In this program, a student may earn the M.P.A. and J.D. degrees in about four years rather than the five years that otherwise would
be required. Students pursuing the dual degree program should plan to be enrolled in course work 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 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 grade of Satisfactory for an approved law course in which the student earns a grade of 2.3 or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved law course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the Instructor without conversion.

**POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES**

Students pursuing a graduate degree in another college may, upon approval of the College of Law and the major chairperson, take up to 6 semester hours of law courses and receive credit toward the graduate degree. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is earned in a law course, an S will be recorded on the transcript. If a student earns below a 2.0, an NC will be recorded, and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average. Law courses may be taken for credit only by students enrolled in a graduate degree program.

Different rules apply to the student enrolled in the Dual J.D.-M.B.A. or J.D.-M.P.A. Programs. Grades must be earned according to the grading system of the respective college, e.g., numerical grades for law courses, letter grades for graduate courses. Refer to section on Grades for the grading scale acceptable toward meeting degree requirements. Cumulative GPA for law courses only will be carried until graduation, at which time both the graduate and the law cumulative will be shown on the permanent record.

**PROFESSIONAL COURSES**

- **081 Civil Procedure I** (3) Binding effect of judgments, selecting proper court (jurisdiction and venue), ascertaining applicable law, and federal and state practice.
- **083 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.
- **084 Contracts II** (3) Continuation of Contracts I. Issues arising after contract formation; interpretation, duty of good faith; conditions, impracticability and frustration of purpose; remedies; the Statute of Frauds; unconsciousness and other controls of promissory liability. Considerable coverage of Article 2 of the Uniform Commercial Code.
- **085 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.
- **086 Legal Process II** (3) Continuation of Legal Process I. Formal legal writing, appellate procedure, and oral advocacy.
- **087 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.
- **088 Torts II** (3) Defenses, including contributory negligence, assumption of risk, comparative negligence, and statutes of limitations; vicarious liability; strict liability; nuisance; products liability; settlement; problems of multiples and addicts; damnum quantum for recovery for personal injury; law reform; defamation, invasion of privacy, and wrongful legal proceedings; misrepresentation, injustice, falsehood, misappropriation of title, and indemnity for breach of contract; constitutional torts.
- **090 Criminal Law** (3) Substantive aspects of criminal conduct; general principles applicable to all criminal conduct; specific analysis of particular crimes; defenses to crimes.
- **091 Property** (4) Introductory course treating issues of ownership, possession, and security interests 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 salient aspects of nuisance law, eminent domain and zoning.
- **092 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; checks and balances; regulation of commerce; intergovernmental immunities.
- **093 Evidence** (4) Rules regulating introduction and exclusion of oral, written and demonstrative evidence at trials and proceedings, including relevance, competency, impeachment, hearsay, privilege, expert testimony, authentication, and judicial notice.
- **094 Legal Profession** (3) Legal, professional and ethical standards applicable to lawyers.
- **095 Computer-Assisted Legal Research** (3) Introduction to major computerized legal data base retrieval systems, LEXIS and WESTLAW. Offered periodically throughout year. May be taken beginning spring of first year after completion of first draft of appellate brief in Legal Process II. Must be completed satisfactorily prior to end of second year of law study. Prereq: Completion of first draft of appellate brief in 806. S/NC only.
- **096 Income Tax I** (4) What is income; whose income is it; when it is income; how it is taxed (capital gains and losses, derivations, deductions, and credits; rates (corporate, estate, and trust).
- **097 Administrative Law** (3) Administrative agency decision-making processes and judicial review of administrative decisions: procedural standards for informal and formal administrative adjudication and rule-making (attention to federal Administrative Procedure Act); constitutional due process standards in administrative settings; and availability, scope and timing of judicial review of agency actions.
- **098 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 requirements.
- **099 Local Government** (3) Distribution of power between state and local governmental units; sources of authority for limitations on local government operations; creation of local boundaries; home rule; problems created by fragmentation of local government units; financing of local services; influence of federal programs on local government finance and decision-making.
- **100 Business Associations** (4) Legal problems associated with business formation, operation, and dissolution of unincorporated and incorporated business firms; legal rights and duties of firm members (principals and agents; partners and limited partners; and corporate shareholders; directors and officers); and others with whom these members interact in connection with firm’s business.
- **101 Advanced Business Associations** (2) Selected topics from law of business associations. Prereq: 827. May be repeated.
- **102 Securities Regulation** (3) Basic structure of federal securities laws; legal protection of investors against misleading of capital by new and growing enterprises; securities transactions by promoters, officers, directors and other insiders; regulation of publicly-held companies, litigation under Rule 10b-5 and other antifraud provisions; and provision of legal and other professional services in connection with securities transactions.
- **103 Business Planning Seminar** (2) Selected problems on corporate and tax aspects of business planning and transactions. Prereq: 818, 827, and 970.
955 Computers and Law (3) Impact of computers on law and practice of law: expository systems; legal skills required in building expert systems; common law office uses of computers; and computerized research. Preparation of lawyers to think effectively concerning use of computers. Prior computer experience not necessary.

953 Education Law (3) Compulsory attendance laws; governmental control over curriculum and extracurricular 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 relationships; recording contract negotiations; 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 specialization; hospital staff privileges; medical malpractice liability; standard of care, proof, causation, defenses, and damages; protection of patient autonomy; consent, informed consent, conception and abortion, choice of treatment, and death and dying; control of communicable diseases; organ transplantation and medical resource allocation.

965 Law and Mentally Disabled Seminar (2) Psychological/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: 818.

971 Income Taxation of Entities (2) Federal income taxation of partners and partnerships; Subchapter S distributions; transactions among corporations and shareholders; fiduciary income taxation. Prereq: 818. Recommended prereq or coreq: 970.

972 Income Taxation of Entities (3) Comparative study of methods and proposed schemes of taxation. Prereq: 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 generation skipping transfers; 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 insurance industry; interpretation of insurance contracts; insurable interest requirement; conditions, warranties, and interpretations; 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 theories of recovery; potential plaintiffs and defendants; statutory and contractual limitations on recovery; damages; causation; and defenses.

985 Social Legislation (3) Systems other than traditional tort remedies for compensating disabled persons and victims of accidents. Workers' Compensation: requirements for employer-employee relationship; injuries or occupational diseases arising out of and in the course of employment; nature of disability; medical and death benefits; and exclusivity of compensation remedy against employer and co-employees. Social Security disability benefits: prerequisites for disability benefits; administrative process; rights to fair hearing; and counsel fees.

990 Issues in the Law (3) Selected topics. May be repeated.

991 Issues in the Law Seminar (2) Selected topics. May be repeated.

993 Directed Research (1-2) Independent research and writing under direct supervision of faculty member. Proposals must be approved by supervising faculty member and by the Dean or the Dean's designee. Maximum of once each semester during last two years of study. Prereq: Second-year standing.

994 Independent Study (1-4) Independent study under direct supervision of faculty member. Proposals must be approved by supervising faculty member and by the Dean or the Dean's designee. Maximum of once each semester during last three semesters of study.

996 Law Review (1) Preparation and completion of an article for the Tennessee Law Review. May be repeated. S/NC only. (Will not count toward total number of elective upper division courses taken S/NC.)

997 Moot Court (1) Participation as member of faculty-supervised interscholastic moot court competition. May be repeated. S/NC only. (Will not count toward total number of elective upper division courses taken S/NC.)

998 Planning and Drafting Project (1) Preparation and completion of planning and drafting project under faculty supervision in conjunction with substantive courses when such planning and drafting option is provided by course instructor. May be repeated.

Library and Information Science

(Office of the Vice Chancellor for Academic Affairs)

MAJOR DEGREE

Library Science .................................................. M.S.L.S.

Jose-Marie Griffths, Director
Glenn E. Estes, Assistant Director

Professors:
Estes, Glenn E. (Liaison), M.S.L.S................................Kent State University
Griffths, Jose-Marie, Ph.D. .................... University of Kentucky
Pollard, Richard, Ph.D. ............... Case Western Reserve University
Wilson, P. (Emeritus), Ph.D. .................... University of Michigan

Associate Professors:
Karrenbrock, Marilyn H., Ed.D. ................. University of California
Pemberton, J. Michael, Ph.D. .................... University of Tennessee
Robinson, William G., Ph.D. .................... University of Illinois
Sinkankas, George M., Ph.D. .................... Pittsburgh Theological Seminary

Assistant Professors:
Palmquist, Ruth A., Ph.D. .................... Syracuse University
Pollard, Richard, Ph.D. .................... University of Michigan
Brunel (UK)

The Graduate School of Library and Information Science provides a program leading to the Master of Science in Library and Information Science. The program is accredited by the American Library Association. The goals and objectives of the school are:

1. To prepare students to understand the nature of information and the role of the librarian and other information agencies in the management of information resources, and the facilitation of information transfer. Students will demonstrate:
   1. Knowledge of the historical role of librarians 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 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.

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 (from the General 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 libraries 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.

Work opportunities in a scientific-technical environment are available through subcontracts with Oak Ridge National Laboratory and the Department of Energy.

A limited number of graduate teaching assistantships are available through the school. Assistantships of this type carry a waiver of fees and stipend and require that recipients work 10 hours per week in the school.

For application forms and information about financial aid and other information about the M.S.L.S. in Library and Information Science, write to Admissions, Graduate School, Library and Information Sciences, University of Tennessee, 804 Volunteer Blvd., Knoxville, TN 37996-4330.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT 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, 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 15th 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/NC only. E

510 Information Professionals and Their Organizations (3) Variety and prospects of information professions; 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 classification, automated cataloging and cataloging of serials and more difficult materials. Prereq: 520. Sp

530 Information Sources and Services (3) Basic bibliographic and information sources, online databases. Interview and search techniques, selection and evaluation of information collections and development and evaluation of services. E, Su, A

531 Sources and Services for the Social Sciences (3) Information sources in social sciences: political science, sociology, psychology, geography, history, anthropology, sources and services in business, education, and law. Prereq: 530. F

532 Sources and Services in Science and Technology (3) Information sources in engineering, physical and life sciences. Prereq: Completion of core courses relevant to practice under guidance of qualified information professionals. Prereq: Consent of advisor. May be repeated. Maximum 6 hrs.

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: Consent of instructor. E, Su, A


540 Research Methods in Library and Information Science (3) Research methods applicable to librarianship and information management. Process and conduct of empirical research; analysis of published research. Prereq: Admission to program or consent of instructor. E, Su, A

550 Library and Information Agency Management (3) Management and organizational concepts applicable to libraries and other information agencies. Prereq: Admission to program or consent of instructor. E, Su, A

551 School Libraries and Media Centers (3) Planning, implementing, and evaluating school library programs. 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. Sp

554 The Library in the Community (3) Application of marketing analysis for planning and policy formulation. Public library focus. Sp

555 Development and Management of Collections (3) Philosophy and process of building and managing collections in libraries and information agencies; environment; community analysis; policy statements; collection evaluation; and preparation of buying lists. Prereq: Consent of instructor. E, Su, A

561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution of materials acquired by libraries; various types of publishers. F

562 Serials (3) Serials collections: selection, acquisition, bibliographic control, storage, maintenance, and public service. Prereq: 560 or consent of instructor. Sp

563 Nonbook Materials (3) Selection, acquisition, evaluation, storage, retrieval, and utilization of non-book media and related topics. F

564 Records Management and Archives (3) Objectives and functional elements of records management and archives programs with various types of organizations, management of creation, distribution, retention, storage, retrieval, protection, and disposition of organizational records regardless of information medium. Sp

565 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 565.)

571 Resources for Children (3) Critical survey of books and related materials of children, major component of genre. Selection, evaluation, and utilization for home and school. F

572 Resources for Young Adults (3) Critical survey of books and materials for young adults; personal, vocational, and recreational needs and interests. Evaluation, selection, and utilization for school and public libraries. Sp

573 Services for Children and Young Adults (3) Philosophy and organization of public and school library services for children and young adults. Reading, listening, and viewing guidance for individuals and groups. Program planning, implementation, and evaluation. Prereq: Consent of instructor. E, Su, A

574 Adult Materials and Services (3) Fiction and subject categories popular and standard; reading, listening, and viewing guidance to meet adult interests; development of specialized collections; services for adults. Su

580 Foundations of Information Science (3) Identifies attributes of information; information theory, relevance, use and user studies, bibliometrics, and major components of information retrieval system design. Relates selected research findings to library and information system practice. F, Sp

581 Information in Society (3) Characteristics of an information society, knowledge and information, effective technological innovation, use and effect of media. Sp

582 Automation (3) Computer concepts and their applications to basic library and information center operations. E, Su, A

583 Information Systems Analysis and Design (3) Tools and methodologies in library/information agency systems planning and implementation. Role and training of systems analyst, systems study from planning through implementation and evaluation, and related topics. Sp

584 Bibliographic Database Design (3) Design and construction of bibliographic databases, record and record layout, database structure, document representation, indexing, abstracting, thesaurus creation and maintenance, and information retrieval. Sp

585 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and external to library/information center environment; existing and prototype systems and interfacing of technologies. Prereq: Consent of instructor. Sp

590 Problems in Library and Information Science (3-6) Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs.

591 Supervised Readings in Library and Information Science (3-6) Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs.

592 Seminar in Library and Information Science (3) Prereq: Consent of instructor. May be repeated with consent of advisor. Maximum 6 hrs.

593 Independent Study (3) Prereq: Consent of advisor. Maximum 6 hrs.

598 Practicum (3) Opportunity to translate theory into practice under guidance of qualified information professionals. Prereq: Completion of core courses relevant to student's practicum design. Written consent of advisor and approval of practicum coordinator. May be repeated with consent of advisor and practicum coordinator. F, Sp

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**Life Sciences**

(Office of the Vice Chancellor for Academic Affairs)

**MAJOR DEGREES**

Life Sciences .............................................. M.S., Ph.D.

Howard I. Adler (Liaison), Chair

Coordinating Council:

Becker, Jeff M., Cellular, Molecular and Developmental Biology

Richard S. Saudargas, Ethology

Schwarz, O. J., Plant Physiology and Genetics

Dougall, D. K., Biotechnology

Farkas, W. R., Environmental Toxicology

Vaughan, Gerald, Physiology

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The Life Sciences Council supports studies and research in the following concentrations: physiology; biotechnology (M. S. only); cellular, molecular and developmental biology; environmental toxicology; ethology; and plant physiology and genetics. Students interested in any of the above areas are encouraged to consult with a representative of the Life Sciences Council.
these areas should contact either the chair of Life Sciences or the director of the area of interest. Each program is overseen by a committee and may have unique admission and graduation requirements.

ADMISSION REQUIREMENTS

1. A Bachelor's degree with a major in a biological, behavioral, or physical science.
2. GRE (general) scores.
3. Three letters of recommendation.
4. Coursework including a year of calculus (differential and integral), one year of chemistry, and a year of physics. Specific course deficiencies may be corrected during the first year.

DEGREE REQUIREMENTS

The Master's degree requires a minimum of 30 semester hours of study approved by the student's committee, a thesis, and an oral examination. Within the biotechnology program only, a non-thesis M.S. option is available. Students choosing this option are expected to complete: (1) two summers' co-op experience in an appropriate industry. An evaluation by supervisor and a written report are required (529, Biotechnology Practicum Cooperative Experience, maximum 4 hrs.); (2) A written report in the form of a scientific paper in an area of specialization chosen by the student and advisor. The minimum requirements for the doctoral degree include at least 6 hours above the 600 level, 24 semester hours of course 600, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a defense of dissertation. Individual programs may have additional requirements.

CONCENTRATIONS

Biotechnology

The biotechnology program will prepare students to participate in the wide variety of opportunities presented by the use of living cells and their components for the production of useful materials. This will be achieved at the M.S. level by a prescribed course of study of the biology and biochemistry of cells and molecules; by formal study of cells and of engineering aspects of biotechnology; and by the development of special expertise in areas such as animal embryo manipulation, automated chemical synthesis of macromolecules, bioprocess engineering, bioproducts and biotransformations, liposomes, microscopy and image processing, monoclonal antibodies and hybridoma technology, plant tissue culture, recombinant DNA technology and risk assessment, and modeling. The production of a research thesis or an industrial co-op experience plus an area of specialization will also be an important part of the training experience.

Required courses are Life Sciences 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 toxins.

Required courses are Biochemistry 561, 562, 604; and Life Sciences 610.

Ethology

Ethology is the naturalist study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; comparative psychology; human ethology; and behavioral ecology and sociobiology.

Required courses for the Master's are Psychology/Zoology 450, 459; Zoology 524, 583; Statistics 531-32; and Zoology/Psychology 516.

The Ph.D. requirements are the same as for the Master's with the additional requirements of one additional statistics course and six semester hours of courses numbered above 600 approved by student's committee.

Physiology

The interdepartmental program in physiology includes research in the areas of cellular, comparative, developmental, exercise, muscle, neurophysiology, regulatory, or reproductive.

Required courses are Zoology 520, 521, Human Anatomy, Comparative Vertebrate Biology, 420; Biochemistry 410; four 600-level seminars; and a statistics sequence.

Plant Physiology and Genetics

This program provides the opportunity for intensive training and research experience in areas spanning the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of physiology and genetics in applied and fundamental aspects of plant science.

Required courses are Life Sciences 510; Botany 521, 522; Biochemistry 511, 512; Plant and Soil Science 471 or Zoology 560; Plant and Soil Science 551; Microbiology 410.

GRADUATE COURSES

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

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

509 Biotechnology Seminar (1-2) Topics of importance to biotechnology. May be repeated. Maximum 6 hrs.

510 Special Topics In Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

511 Advanced Cellular Biology (3) Cell structure and functions at molecular and supramolecular level. Membrane structure, function, and biogenesis; cellular communication; receptors and membrane flow; growth regulation and oncogene; plant cell structure and function; contractility and motility; mitosis and meiosis; blood and immune cells.

512 Advanced Molecular Biology (4) (Same as Biochemistry 512)

525 Research Practicum in Life Sciences (1-3) Individual sections for each of biotechnology; cellular, molecular and developmental biology; environmental toxicology; ethology; plant physiology and genetics; and physiology. May be repeated. Maximum 9 hrs.

529 Biotechnology Practicum Co-operative Experience (2) Work experience in commercial organization for students undertaking non-thesis option of biotechnology concentration. Evaluation by supervisor and written report by student. May be repeated. Maximum 4 hrs.

531 Biotechnology Laboratory (3) Growth of microorganisms, analysis of extracellular and intracellular components.

532 Biotechnology Laboratory (3) Pilot scale yeast cultivation, enzyme isolation, purification and characterization. Application of purified enzymes to food production fermentations and fermentation process control.

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

610 Advanced Topics in Life Sciences (1-3) Topics vary. May be repeated. Maximum 9 hrs.

Logistics

See Marketing, Logistics and Transportation

Management

(Concourse of Business Administration)

MAJOR

Business Administration

Oscar Fowler, Head

DEGREES

Business Administration .......................... MBA, Ph.D.

Professors:

Boling, Ronald W. (Emeritus), Ph.D. .......... Stanford
Dewhirt, H. Dudley, Ph.D. ......................... Texas
James, Lawrence R., Ph.D. ....................... Utah
Keally, A. H. (Emeritus), MBA ........... Pennsylvania
Larsen, John M., Jr., (Emeritus), Ph.D. ....... Purdue
Nee, C. Warren, Ph.D. ......................... Alabama
Reed, Don (Emeritus), Ph.D. .............. Edinburgh
Stahl, Michael J., Ph.D. .................... Rensselaer
Vance, S. C. (Emeritus) (W.B. Stokely Prof.), Ph.D. ....................... Pennsylvania
Wagoner, George A. (Emeritus), M.S. ...... Indiana
White, H. G. (Emeritus) (Distinguished Prof.), Ph.D. .......................... Tennessee

Associate Professors:

Dobkins, Gregory H., Ph.D. .................... VPI
Fowler, Oscar S., Ph.D. ......................... Georgia
Fryxell, Gerald E. (Liaison), Ph.D. ........... Indiana
Gilbert, Kenneth C., Ph.D. ....................... Tennessee
Ladd, Robert T., Ph.D. .......................... Georgia
Maddock, Robert C., Ph.D. ...................... Texas
Miller, Alx, Ph.D. ................................. Washington
Russell, Michael C., Ph.D. .................. Akron
Russell, Joyce E. A., Ph.D. ................... Akron
Srinivasan, M. M., Ph.D. ..................... Northeastern

Assistant Professors:

Bowers, Melissa R., Ph.D. .......................... Clemson
BUSINESS ADMINISTRATION CONCENTRATIONS

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


Minimum course requirements for management—Three courses from the following list: 511, 521, 522, 531, 541, 542, 551, 571, 581, 593.

North Carolina Business Administration 510, 599. Selection must be approved by the Management Department MBA advisor. For forest industries management—511; Forestry 560, 565. Environmental management—581 plus two approved courses from the following list: Ecology 520, 530, 537, 555; Environmental Engineering 510, 555, 556; Chemical Engineering 581; Economics 677, 678; Agricultural Economics 570; Sociology 560, 665; Law 685, 867; Geography 577. Additional courses may be accepted subject to approval by Management Department Chairperson or designated faculty.

Ph.D. Concentration: Management.

Minimum course requirements for operations management—541 and 542; two semesters of 640 (may be repeated for credit); one additional semester of approved doctoral seminar work. For strategic management—610, 611, 612, 613.

Graduate Courses

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

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

504 Management of Organizational Behavior (3) Integration of individual and group differences, organizational theory and design, motivation, leadership, human resource planning and career implications with strategy, planning, and decision making.

510 Organizational Theory: Integrated Structure and Behavior (3) Cases, group projects, discussion; organizational theories, orientational effectiveness; contextual factors of organizations: environment, size, technology, organizational structure configurations, organization design; social influences on organizational effectiveness; motivation, leadership, group behavior, intergroup relations, organization change and development.

521 Personnel Administration (3) Personnel functions and human resource management. Community relations, recruiting, selection, training, performance evaluation, wage and salary administration, legal framework as it affects personnel.

522 Labor Relations and Collective Bargaining (3) American labor history, structure and philosophy of bargaining, dispute settlement, and contract administration. (Same as Economics 562.)

525-26 Industrial and Organizational Psychology (1-3, 3-1-1) Readings in industrial and organizational psychology. Available only by arrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

531 Management of Technology-Based Organizations (3) Role of technology and innovation in formulation and implementation of strategy. Management of research and development function and coordination with other functions. Management of scientists and engineers.

541 Operations Management I (3) Techniques applicable to design of systems in operations function.

542 Operations Management II (3) Operations planning and control function. Application of models to real-world systems.

551 Management of New Ventures (3) Integration of various functional disciplines and their application to general management of ventures formed both within larger corporations and independently. Preparation of a venture plan, case analysis.

567-568 Proseminar in Industrial/Organizational Psychology (3) Basic thought, concepts, and issues required for advanced graduate study in industrial and organizational psychology. Must be taken in sequence during student's first year of study in industrial and organizational psychology program. Consent of instructor required for all non-industrial/organizational psychology program students. (Same as Psychology 517-18.)

571 International Management (3) Analysis of environment of international business firms and impact of internal and external factors on managerial decisions.

581 Environmental Management (3) Managerial frameworks for addressing environmental issues. Most pressing environmental challenges; options compatible with sustained business performances. Cases, field projects, research papers.

593 Directed Independent Study (1-3) Topic of mutual interest. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

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

601 Research Methods (3) Seminar covering broad range of issues: research process as applied to study of strategic management. Literature and examples of research. Research proposal.

610 Seminar in Advanced Organization Theory (3) Analysis of functional and complex organizations. Classical and open systems models, organization growth and change, organizational effectiveness and design of complex organizations.

611 Seminar in Strategic Management I (3) Analysis of concepts and research in strategic management.

612 Seminar in Strategic Management II (3) Analysis of concepts and research in strategic management.

613 Seminar in Strategic Management III (3) Review and analysis of important books and monographs in strategic management. Understanding evolution of thought and emergence of distinct paradigms.

625 Seminar in Organizational Psychology (3) In-depth analysis of theories, concepts, and issues associated with psychology of organizational leadership and work motivation. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 625.)

626 Seminar in Industrial Psychology (3) In-depth analysis of current issues and problems; performance appraisal/criterion development, and training and development. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 626.)

627 Seminar in Applied Industrial Psychology (3) In-depth analysis of industrial psychology, methods: advanced quantitative psychometrics and employee selection. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 627.)

638 Current Topics in Industrial/Organizational Psychology (3) In-depth analysis of various topics: organizational change and development, psychology and problems of interviewing, consumer behavior. Prereq: 567, 568, consent of instructor. May be repeated. (Same as Psychology 638.)

640 Seminar in Operations Management (3) Research and concepts. Application of quantitative methods to operations management problems. May be repeated.

650 Field Work in Industrial and Organizational Psychology (1-12) Supervised field practice in industrial and organizational psychology. 1 hr per 30 hrs of practice. May be repeated. Maximum 12 hrs. (Same as Psychology 650.)

Additional Committee Members:

Dean, Thomas J., Ph.D. Colorado State University
Edirisinghe, Chanaka F., Ph.D. British Columbia Institute of Technology
Judge, William Q., Ph.D. North Carolina State University
Koon, Charles E., Ph.D. Michigan State University

Assistant Professors:

Bowers, Melissa R., Ph.D. Clemson University
Edirisinghe, Chanaka F., Ph.D. British Columbia Institute of Technology
Leitnaker, Mary G., Statistics Department
Ralston, Bruce A., Geography Department

THE MASTER'S PROGRAM

The M.S. program in Management Science is an interdisciplinary program and is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science coursework will expose students to both the theoretical development of quantitative techniques and their application to managerial decision making. In addition to the development of sufficient mathematical maturity for creative use of quantitative skills, the program requires concentrated study in a supporting area. Supporting areas are available in other departments of the College of Business Administration (excluding statistics) as well as in computer science, public administration, ecology, and other areas, subject to approval by the Management Science Committee.

Admissions Requirements

The Master's program requires three Graduate School Rating Forms and the GRE or GMAT. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in three semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

<table>
<thead>
<tr>
<th>Hours</th>
<th>Core Requirements</th>
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<tbody>
<tr>
<td>14</td>
<td>Management Science 531, 532, 533, 534</td>
</tr>
<tr>
<td>9</td>
<td>Statistics 563</td>
</tr>
<tr>
<td>6</td>
<td>Applied specialization area (approved by advisor)</td>
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<tr>
<td></td>
<td>Statistics elective—500 level or above (approved by advisor)</td>
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<tr>
<td></td>
<td>Mathematics—400 level or above (approved by advisor)</td>
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</tbody>
</table>
Electives selected from mathematics, statistics, computer science, and/or management science area

**TOTAL** 38

A thesis option is available to qualified students which substitutes 6 hours of thesis credit for the following 6 hours of coursework: Management Science 534, 3 hours in the applied concentration area and 3 hours of electives in any area. The Management Science Committee will work closely with the student in tailoring a program to his/her needs. The committee must approve a tentative overall program during the student's first semester and must approve all courses on a semester-by-semester basis.

Recognizing the diverse backgrounds and needs of Management Science M.S. students, the Management Science Committee is prepared to waive some of the above requirements on an individual basis. For example, an undergraduate mathematics major with a strong background may be allowed to take 6 additional hours of electives in place of the mathematics 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 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, statistics, and mathematical programming. Topics include the theory of determinants 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.

**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 he/she has improved his/her cumulative grade-point average to 3.0 or higher at the end of the probationary period. The probationary period is defined as the next semester's coursework as established by the degree program for full-time students and the next two semesters' coursework as established by the degree program for part-time students.

**PREREQUISITES FOR MANAGEMENT SCIENCE COURSES**

The Management Science Program is interdisciplinary and students in other degree programs are encouraged to enroll in management science courses. Course prerequisites are designed to indicate the level at which courses are taught. Interested students whose prior coursework does not match the prerequisites are encouraged to seek the instructor's guidance and consent to enroll.

**BUSINESS ADMINISTRATION CONCENTRATION**

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

**MBA Concentration: Management Science**

Minimum course requirements are 531, 532 and 534.

**GRADUATE COURSES**

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

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


532 Stochastic Models in Management Science (3) Discrete-time Markov chains, Poisson processes, continuous-time Markov chains, renewal theory, and queueing theory. Prereq: Statistics 563 and Mathematical Analysis or consent of instructor. Sp

533 Computational Mathematical Programming (3) Advanced modeling, computational and reporting techniques in practical mathematical programming. Prereq: 531 and proficiency in PASCAL. F

534 Application of Management Science Methods (3) Application of methods of 531 and 532 to real world problems. Exposure to existing problem in industry or elsewhere. F


581 Special Topics in Management Science (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

593 Management Science Problems (1-6) Directed study on subject of mutual interest. E

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

621 Network Flows (3) Treatment of network optimization algorithms, transportation and transshipment models, primal-dual and primal-basis tree methods. Prereq: 531 or equivalent. F

631 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group theoretic algorithms. Prereq: 531 or equivalent. F

641 Large Scale Mathematical Programming (3) Mathematical optimization models and methods for large scale systems. Decomposition, factorization and parametric methods. Model validation and management. Prereq: 531, 533. F

651 Nonlinear Optimization (3) Solution of constrained and unconstrained nonlinear programming problems. Practical algorithms that perform well in recent practice. Prereq: 531 or equivalent. F


Management Science 123
Marketing, Logistics and Transportation

(Complete of Business Administration)

MAJOR DEGREES

Business Administration MBA, Ph.D.

David W. Schumann, Head

Marketing

Professors:
- Barnaby, D. J., Ph.D. \( \ldots \) Purdue
- Cadotte, E. R., Ph.D. \( \ldots \) Ohio State
- Jenkins, R. L., Ph.D. \( \ldots \) Ohio State
- Woodruff, R. B., DBA \( \ldots \) Indiana

Associate Professors:
- Gardial, S. F., Ph.D. \( \ldots \) Houston
- Reizenstein, R. C., Ph.D. \( \ldots \) Cornell
- Rentz, J. O. (Liaison), Ph.D. \( \ldots \) Georgia
- Schumann, D. W., Ph.D. \( \ldots \) Missouri

Assistant Professors:
- Dabholkar, P. A., Ph.D. \( \ldots \) Georgia State
- Johnston, T. C., Ph.D. \( \ldots \) California
- Moon, M. A., Ph.D. \( \ldots \) North Carolina
- Song, X. M., Ph.D. \( \ldots \) Virginia

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Marketing.

Minimum course requirements are three courses from the following: 503, 504, 505, 506, 550, 593, 598, 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

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

503 Buyer Behavior—Analysis for Marketing (3) Consumer behavior concepts and processes developed and applied to market analysis and design, and control of marketing programs. Social psychology and demographic factors that affect consumer product, brand and patronage decisions. Prerequisite: Business Administration 504 and 505 or consent of instructor.

504 Analyzing Market Opportunity for Marketing Decisions (3) Major determinants of opportunity in markets, framework for finding markets and analyzing them for opportunity, application of market opportunity analysis to marketing strategy decisions. Prerequisite: Business Administration 504 and 505 or consent of instructor.

505 Marketing Research and Information Planning (3) Design of a rigorous marketing study from inception to implementation of results by recognizing key decision points and critically evaluating merit of research project. Prerequisite: Business Administration 504 and 505 or consent of instructor.

506 Marketing Strategy (3) Integration of concepts and analytical skills from each component area of marketing to formulate cohesive, well-organized marketing program. Prerequisite: Business Administration 504 and 505 or consent of instructor.

550 Market Opportunity Analysis for New Ventures (3) Concepts for understanding coverage of new venture MOA and various information sources and procedures; identify and analyze sales opportunities in markets for new product or service. Prerequisite: Consent of instructor.

593 Independent Study (3) Directed research and study. Prerequisite: MBA Core and consent of instructor. May be repeated. Maximum 6 hrs.

599 Special Topics Seminar (3) Topics vary: nonbusiness marketing applications, macroenvironmental issues, market segmentation, international marketing, services marketing, marketing channels, and related issues. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

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

601 Marketing Theory (3) Nature and scope of marketing, role of theory development and theory testing important to marketing research.

602 Research Methods I (3) Research process: problem formulation, research and experimental design, measurement and implementation of results. Design: experimental design, survey research, and measurement.

603 Marketing Thought (3) Marketing literature across number of research areas. Evaluate individual works, examine state of research in each area, 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. (Liaison), Ph.D. \( \ldots \) Michigan State
- Dicer, G. N., DBA \( \ldots \) Indiana
- Frye, J. L. (Emeritus), Ph.D. \( \ldots \) Florida
- Hendrix, F. L. (Emeritus), Ph.D. \( \ldots \) North Carolina
- Langley, C. J., Jr., Ph.D. \( \ldots \) Penn State
- Mundy, R. A., Ph.D. \( \ldots \) Penn State
- Patton, E. P., Ph.D. \( \ldots \) North Carolina

Associate Professor:
- Foggin, J. H., DBA \( \ldots \) Indiana

Assistant Professor:
- Holcomb, M. C., Ph.D. \( \ldots \) Tennessee

BUSINESS ADMINISTRATION CONCENTRATIONS

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

MBA Concentration: Logistics and Transportation.

Minimum course requirements are 501, 508, and one course from the following: 504, 506, 507, 593, and 599.

Ph.D. Concentration: Logistics and Transportation.

Minimum course requirements are 12 hours to include 601, 602, 603.

GRADUATE COURSES

501 Survey of Logistics and Transportation (3) U.S. logistics and transportation: physical, economic, social, and political environment; financing, managing, maintaining, and enhancing U.S. transport infrastructure.

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

504 Freight Carrier Systems and Management (3) Analysis of freight carrier management's efforts to provide services demanded by consumers in logistics and transportation marketplace.

506 Logistics Systems Management (3) Development of strategy for management of logistics systems. Executive level integration of logistics operations with marketing, production, and other decision areas. Practical applications through case approach and simulation game.

507 International Logistics and Transportation (3) Logistics strategy in the multi-national firm: materials management, international sources and distribution, and importing/exporting. Issues: international carrier management and operations and comparative national transport systems analysis.

508 Executive-In-Residence Seminar in Logistics and Transportation Strategy (3) Integrated case course in logistics and transportation strategy, participation in Executive-In-Residence program that provides student interaction with top-level logistics and transportation executives.

593 Independent Study (3-6) Directed research and study. Prerequisite: Consent of instructor. May be repeated.

599 Special Topics in Logistics and Transportation (3-6) Seminar designed to study specific current problem areas in logistics and transportation. Topic announced prior to offering. Prerequisite: Consent of instructor. May be repeated.

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

601 Seminar in Logistics and Transportation Models (3) Analysis of contemporary models and methodologies in logistics and transportation research, topical coverage at discretion of instructor.

602 Seminar in Evolution of Logistics Thought (3) Traces evolution of logistics and transportation thought, dynamic development of principles and tools developed as organizational missions and environmental change. Economic and policy issues peculiar to transportation and other service organizations.

603 Research Methodology in Logistics and Transportation (3) Various research methods used in logistics and transportation. History and development of body of knowledge. Overview of literature. Discussion of contemporary research issues. Development of student's dissertation research proposal.
Materials Science and Engineering

(College of Engineering)

MAJORS DEGREES
Metallurgical Engineering .......... M.S., Ph.D.
Polymer Engineering ............... M.S., Ph.D.

Joseph E. Spruiell, Head

Professors:
Bogue, Donald C., Ph.D. .................. Delaware
Borie, Bernard S., Ph.D. ................. MIT
Brooks, C. R., Ph.D. ......................... Tennessee
Buchanan, Raymond A., Ph.D. ....... Vanderbilt
Clark, Edward S., Ph.D. .................. California
Fellers, J. F., Ph.D. ......................... Akron
Law, P. K., Ph.D. ........................... Northwestern
Lowndes, Donald H., Ph.D. .......... Colorado
Lundin, Carl D., Ph.D. ................. Rensselaer
McHargue, C. J., Ph.D. ............. Kentucky
Oliver, Ben F., Ph.D. ...................... Penn State
Pedraza, A. J., Ph.D. ..................... National (Argentina)
Phillips, Paul J., Ph.D. ................. Liverpool (UK)
Spruiell, Joseph E. (Liaison), Ph.D. .... Tennessee
Stansbury, E. E. (Emeritus), Ph.D. .... Cincinnati

Associate Professors:
Becker, William T., Ph.D. ............... Illinois
Benson, R. S., Ph.D. ...................... Florida State
Meek, Thomas T., Ph.D. ................. Ohio State

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Both the metallurgical and polymer programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, applied engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult materials science and engineering faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

Areas of concentration within the metallurgical engineering program include physical metallurgy; materials processing; welding metallurgy and materials joining; corrosion behavior; failure analysis; and mechanical and physical behavior of materials. Specializations in electronic and ceramic materials are available.

Areas of concentration within the polymer engineering program include rheology and polymer processing; polymer morphology; mechanical, physical and chemical behavior of polymers; and composite materials.

THE MASTER’S PROGRAM

Thesis Option
A total of 30 semester hours is required for the M.S. degree in either Metallurgical Engineering or Polymer Engineering. Additional requirements include:
1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering or polymer engineering. The polymer engineering major must include 540, 541, 543, 546, 549, 550 and 572 unless similar material has been covered in prior coursework.

2. Additional courses amounting to 6 to 12 hours total in any approved engineering, chemistry, mathematics, physics, or other related fields.


All resident students are required to register for and participate in the graduate seminar in metallurgical engineering or polymer engineering, as appropriate, during each semester in which it is offered. Credits for the seminar do not count towards satisfying the coursework requirements.

Non-Thesis Option
Under certain conditions, a candidate may apply for a non-thesis option. To be eligible, the candidate must show evidence of significant professional experience after the baccalaureate degree; at least five years of industrial experience or research publications would be examples of such evidence. A departmental faculty meeting will consider each application individually. Upon acceptance, a supervisory committee of three will be appointed, at least two being from the Department of Materials Science and Engineering. The requirements for completion of the non-thesis option are as follows:
1. A total of at least 33 hours in graduate courses in metallurgical engineering, polymer engineering and related areas. The minimum requirements are 21 hours in the Department of Materials Science and Engineering and up to 12 hours in other engineering or science courses. The candidate’s degree program must be approved by the faculty committee.

2. Satisfactory completion of a critical review of the literature in an area related to metallurgical, polymer or materials engineering (580).

3. Satisfactory performance in an oral examination to be conducted by the faculty committee and covering the review paper and other areas of metallurgical or polymer engineering.

THE DOCTORAL PROGRAM

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

Department requirements consist of the satisfactory completion of:
1. Graduate courses in materials science and engineering amounting to approximately 24 semester hours, at least 8 of which must be in 500 series courses.

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

3. The comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.

4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 503 or 504 every semester offered.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Metallurgical Engineering is available to residents of the state of Virginia; the M.S. and Ph.D. programs in Polymer Engineering are available to residents of Arkansas, Kentucky, Louisiana, Texas, or Virginia. Additional information may be obtained from the Residency Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

405 Structural Characterization of Materials (4) X-ray diffraction and fluorescence; scanning and transmission electron microscopy; microanalytical techniques.

421 Mechanical Behavior of Materials II (3) Description of stress and strain; linear elastic constitutive equations, isotropic and anisotropic moduli 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.

422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metallurgical processing. Ferrous and nonferrous pyrometallurgical refining; slag-metal equilibria, solidification, gas-metal processing. Prereq: 405.

425 Metallurgical Applications in Manufacturing and Processing (3) Fabrication methods, standards and specifications; principles of theromomechanical processing for finished and semi-finished 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 dies; effects and extrudate swell; selected application, screw extrusion, injection molding; synthetic fibers, spinning methods, structure development, properties.

444 Plastics Fabrication and Design (3) Lectures, laboratories and field trips; unit operations of plastics fabrication; plastics classification; design and selection criteria; processing techniques; characterization laboratory.


472 Fundamental Principles of Composite Materials (3) Establishment of physical principles 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 orthopedic, cardiovascular, and dental surgical implant devices; corrosion and degradation problems; material properties of primary importance: tissue response to synthetic materials. Prereq: 201. Recommended for engineering science and mechanics majors.

475 Fracture-Safe Design (3) same as Engineering Science and Mechanics 450.

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
504 Graduate Seminar in Metallurgical 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 defects and 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 effects; effect of ordering and solution alloying; polycrystalline behavior in terms of single crystal deformation mechanisms; texture formation. Prereq: 301, 320 or consent of instructor.

524 Metallurgical Thermodynamics (3) Applications of thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems. Prereq: 570 or equivalent.

525-26 Welding Metallurgy (3,3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; thermal behavior of hot cracking, cold cracking and porosity formation; applications to process utilization.

529 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion problems; random walk and mechanisms of diffusion; diffusion in dilute and concentrated alloys. Kirkendall effect; high diffusivity paths.

530 Phase Transformations in Metallic Materials (3) Thermodynamic and kinetic equilibrium theory of nucleation in solids; kinetics and morphology of diffusion controlled processes; kinetics of interface controlled phase transformations; crystallography and kinetics of martensitic transformations.

531 Advanced Corrosion (3) Analyses of corrosion processes in terms of polarization measurements and Pourbaix diagram. Influence of environmental and mechanical factors contributing to pitting, crevice, fretting, wear, fatigue and stress corrosion. Prereq: 470 or consent of instructor.


540 Basic Polymer Chemistry (3) Synthesis, reactions, and degradation of polymers. Molecular characterization; solution methods and spectroscopy. Prereq: Coreq: 304 or equivalent.

541 Fluid Mechanics and Polymer Processing (3) Navier-Stokes equations and illustrative problems; applications in chemical engineering and polymer engineering, packed and fluidized beds, multiphase systems. Basic concepts in rheology; applications in polymer processing: screw extrusion, fiber spinning, injection molding. (Same as Chemical Engineering 541.)

542 Further Topics in Polymer Processing (3) Description and analysis of selected polymer processing operations.


544 Polymer Solution Thermodynamics and Characterization (3) Theories of solutions, statistical thermodynamics. Characterization, treatment of chromatography, viscosity, light scattering and osmotic pressure. Prereq: Undergraduate physical chemistry.

546 Mechanical Properties of Solid Polymers (3) Types of testing; Hook's law and rubber elasticity; plastic deformation; fracture; linear viscoelasticity; dynamic mechanical behavior and testing; loss tangent; experimental methods. 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, rheometry, mechanical properties of polymer processing operations. Coreq: 540 or consent of instructor.

560 Principles of Ceramic Processing (3) Treatment of ceramic processing; raw materials preparation and characterization; powder consolidation; drying, firing, sintering techniques, mechanisms and kinetics. Prereq: 390 or equivalent.

561 Inorganic Glass Forming Systems (3) Physical and chemical nature of inorganic glasses; structural theories of glass formation; major glass forming systems; silica, other oxide glasses, nitrate glasses, zirconia, titania, and chalcogenide glasses. Prereq: 360, Chemistry 371.

562 Experimental Mechanics of Composite Materials (3) (Same as Engineering Science and Mechanics 562.)

570 Chemical Thermodynamics (3) Enthalpy and entropy of mixing; Gibbs function and chemical potential methods of measuring activity; solution theories; phase rule; heat capacity of gases, liquids and solids; calculation of phase diagrams. Prereq: 303 or equivalent.

571 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 304 or equivalent.

572 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to determination of structure; powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of orientation; 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 biocompatible new biomaterials and new materials processing techniques. Prereq: 470, 474 or consent of instructor.

574 Formality of Materials (3) Modeling and analysis of finite plastic strain with application to primary and secondary forming operations: crystalline and noncrystalline materials; flow localization, instability, predictive testing. Prereq: Consent of instructor.

576-77 Special Topics in Materials Science and Engineering (3,3) Topics of current significance and interest. Prereq: Consent of instructor. May be repeated.


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

621-22 Theoretical Metallurgy (3,3) Topics in solid state physics as applied to metallurgy; introduction to quantum theory, specific heats, electron theory of solids, electrical and thermal conductivity, magnetic properties, theories of alloy formation. Prereq: Consent of instructor.

623-24 Solidification and Crystal Growth (3,3) Theories of solidification, fluid flow effects, magneto- hydrodynamics of incompressible fluids, growth stability theory, thermodynamic applications, rapid solidification techniques. Prereq: Consent of instructor.

641 Advanced Rheology and Viscoelastice Theory (3) Continuum mechanics, formulation of viscoelastic theories for describing deformation and flow of polymeric materials. Application to polymer processing problems. Recommended for MS candidates working in rheological areas. Prereq: 541.

642 Advanced Topics in Polymer Processing (3) Application of theoretical behavior of structure development to analysis of polymer processing operations. Prereq: 541. (Same as Chemical Engineering 642.)

643 Phase Transformations in Polymers (3) Glass transition and glassy state; annealing of polymers; glassy state; crystallization of polymers; nucleation, growth and morphology; secondary nucleation theory; solidification of copolymers; crystallization under stress. Prereq: 543.

671 Quantitative Microscopy (3) Principal acoustic, x-ray, neutron, electron and field-ion techniques for examination of microstructures of materials. Prereq: 405.


676-77 Advanced Topics in Materials Science and Engineering (3,3) Selected development and/or advanced special topics. Prereq: Consent of instructor. May be repeated.

678-79 Seminar in Recent Advances in Materials Science and Engineering (3,3) Directed and independent study of advanced topics. Prereq: Consent of instructor. May be repeated.

**Mathematics**

(Mathematics 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
Anderson, D. F., Ph.D. ................... Brown
Anderson, D. F., Ph.D. ................... Chicago
Baker, G. A., Ph.D. ....................... Cornell
Bradley, John S. (Emeritus), Ph.D. ....... Iowa
Carruth, J. H., Ph.D. ...................... Louisana State
Clark, C., Ph.D. ......................... Maryland
Dobb, D. E., Ph.D. ....................... Cornell
Dyak, J., Ph.D. ........................... Warsaw
Fradens, Henry, Ph.D. ..................... Illinois
Gross, L. J., Ph.D. ....................... Cornell
Hallam, T. G., Ph.D. ...................... Missouri
Hinton, D. B. (Liaison), Ph.D. .......... Tennessee
Householder, A. S. (Emeritus), Ph.D. ........ Chicago
Husch, L. S., Ph.D. ........................ Florida State
Johannson, K., Ph.D. ...................... Bielefeld
Jordan, G. Samuel, Ph.D. ............... Wisconsin
Karakashian, O., Ph.D. .................. Harvard
Kuperior, 3. A. (UTSI), Ph. D. .......... MIT
Lenhart, S., Ph.D. ........................ Kentucky
McConnel, R. M., Ph.D. ................ Duke
Mathews, H. T., Ph.D. .................... Tulane
Miller, D. D. (Emeritus), Ph.D. ........ Michigan
Rajput, B. S., Ph.D. ...................... Illinois
Reddy, K. C. (UTSI), Ph.D. ............ Indian IT
Rosinski, J., Ph.D. ....................... Wroclaw
Schaefer, P. W., Ph.D. .................. Maryland
Serbin, Steve, Ph.D. ..................... Cornell
Soni, K., Ph.D. .......................... Oregon State
Stallman, F. W. (Emeritus), Ph. D. .... Gieslen
Stephenson, K. R., Ph.D. ............... Wisconsin
Sundberg, C., Ph.D. ..................... Wisconsin
Thistlthwaite, M. B., Ph.D. .......... Manchester
Wade, W. R., Ph.D. ...................... California (Riverside)
Wagner, C. G., Ph.D. ..................... Duke

Associate Professors:

Kimble, K. R. (UTSI), Ph.D. ........... Ohio State
Kuo, Y., Ph.D. .......................... Cincinnati
Mulay, S., Ph.D. ........................ Purdue
THE MASTER OF MATHEMATICS PROGRAM

Before admission to the Master of Mathematics program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state, or (b) three years of elementary school, secondary school, or community college teaching experience. Applicants must have successfully completed one year of calculus (141-42 or equivalent) and a course in matrix algebra (251 or equivalent). The following requirements must be met:

1. Complete 30 hours of coursework of which 21 must be at the 500 level. The coursework must include 504, 505, 506, 507, and 6 hours in 509. At most, 6 hours may be taken outside the Department of Mathematics (Selected in consultation with the advisor).
2. Pass a final examination upon completion of all coursework.

In exceptional circumstances, part of the admission requirement (b) might be satisfied concurrently with coursework. Normally, a Master of Mathematics degree student will start the program by taking 504 during the summer.

THE MASTER OF SCIENCE PROGRAM

The department offers two options for the Master of Science degree. The first option requires a thesis for which 6 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 may be in an area outside the department and 15 must be in courses for students numbered above 500. Of the 6 additional hours, 9 in courses approved by the advisory committee may be taken in fields other than mathematics. For this option it is required that a written final examination be passed and that credit be received for a reading course (598) in which a term paper or project is required.

THE DOCTORAL PROGRAM

For the Ph.D. in Mathematics, the student must meet the following 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 after electing such a transfer is determined by the complete history of his/her earlier examinations from the standard program and part 1 of the mathematical ecology concentration. A description of both programs is below.

2. Demonstrate proficiency in one foreign language, normally French, German, or Russian. This requirement is to be met prior to the examination in the area of specialization. The student's doctoral committee may require that 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 examination only twice.

4. Take a one-year, 600-level sequence in mathematics outside of his/her area of specialization. The use of the course selected to fulfill this requirement must be approved by the department head and the student's doctoral committee (such approval may occur after completion of the course).

Standard Program

Pass written examinations covering four subjects, at least three of which must be from the following list:

a. Modern Algebra 551-52
b. Complex Analysis 543-44
c. Topology 561-62
d. Real Analysis 541-42
e. Applied Linear Analysis 547-48
f. Partial Differential Equations 555-56
g. Ordinary Differential Equations 531-32
h. Numerical Mathematics 571-72
i. Statistics 525-26
j. Probability 523-24

Students may not count examinations in both d. and e., in f. and g., in i. and j. toward the required four passes. Those who choose four from this list must choose at least two from a. through e. and the students who choose only three from this list must choose one from a. through e.

Students selecting only three from the above list will also be required to pass a written exam on an area of applied mathematics (e.g., fluids, elasticity, mathematical ecology) approved as an examination topic for that student by the Graduate Committee and the Applied Mathematics Committee. The Graduate Committee will appoint a section of faculty who will submit a list of topics and references to the Graduate Committee and the Applied Mathematics Committee for approval.

Students may take as many of the written examinations as desired at any time these exams are given, subject to the following conditions:

1. The exams to be taken must be approved in advance by the student's advisory committee.

2. At most, 4 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.

3. Students may take a collection of written examinations a maximum of four times, but no one failing five exams, counting possible repetitions, will be permitted to take another round of exams.

Mathematical Ecology Concentration

Students must pass examinations in two areas:

1. Three subjects in mathematics. One must be mathematical ecology and two must be from the list under the standard program. Students may not count passes on examinations in both d. and e., in f. and g., nor in i. and j. toward the required three passes. At least one exam must be chosen from a. through e.

Students may take as many written examinations as desired at any time these exams are given subject to the following conditions:

a. The exams to be taken must be approved in advance by the student's advisory committee.

b. At most 3 minus n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.

Students may take a collection of written examinations a maximum of three times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.

2. Ecology, covering material selected from nine hours of coursework outside of mathematics at the 500 level or above.

a. The courses submitted for examination must be approved by the student's doctoral committee and the departmental Graduate Committee. The exam is to be prepared, administered, and graded by instructors of the courses involved, along with at least one member of the mathematical ecology section. The student must obtain written agreement to participate in the examination from instructors of these courses and from at least one member of the mathematical ecology section before submitting materials to the committees for approval.

b. Students may take the written examination at most twice.

GRADUATE COURSES

400 History of Mathematics (3) Development of major ideas in mathematics from ancient to modern times and influence of ideas in science, technology, philosophy, art, and other areas. Writing emphasis course: at least one in-class essay examination and 3000 words of writing outside classroom. Prereq: Calculus.

401 Mathematics and Microcomputers (3) Primarily for students seeking certification as mathematics teachers at secondary level. Use of microcomputers to study concepts and problems in mathematics. Does not satisfy the major requirements for a B.S. or B.M.S. in mathematics. Prereq: Calculus I.

404 Applied Vector Calculus (3) Topics from multivariable and vector calculus; line and surface integrals, divergence theorem and theorems of Gauss and Stokes. Prereq: Calculus III.

405 Models in Biology (3) Difference and differential equations and their use in biological systems. Prereq: Calculus II or BioCalculus II.

411 Mathematical Modeling (3) Construction and analysis of mathematical models used in science and industry. Prereq: Differential Equations, Calculus III, and Matrices I.

421 Combinatorics (3) Introduction to problems of construction and enumeration for discrete structures.

422 Topology I (3) Theory of topological spaces; connectedness, compactness, and completeness. Prereq: Real Analysis I.
sequences, partitions, graphs, finite fields and geometries, or experimental designs. Prereq: 323 or consent of instructor.

423 Probability II (3) Law of large numbers and central limit theorems for discrete and continuous random variables; distributions, discrete and continuous parameter Markov chains and their applications, Kolmogorov differential equations; Brownian motion process as limit of random walks. Prereq: Probability I or consent of instructor.

425 Statistics (3) Derivation of standard statistical distributions; F and χ²; independence of sample mean and variance; basic limit theorems; point and interval estimation, Bayesian estimates; statistical hypothesis, Neyman-Pearson theorem; likelihood ratio, and other parametric and non-parametric tests; sufficient statistics. Prereq: Probability I or consent of instructor.


433 Complex Variables I (3) Theory of complex variables: residue theory and contour integrals. Prereq: Calculus III. Recommended prereq: 300- or 400-level mathematics course.

443 Complex Variables II (3) Applications of complex variables to steady-state temperatures, electrostatics, and fluid flow. Prereq: 443.

445-46 Advanced Calculus I,II (3,3) Theory of sequences and series, partitions, graphs, finite fields and geometric, and Poisson distributions. Continuous random variables. Normal distributions. Sampling theory. 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.

504 Discrete Mathematics for Teachers (3) Mathematical logic and language, proof by contradiction, and the pigeonhole principle. Prereq: Consent of instructor or 453 and programming experience. May not apply toward M.S. degree in mathematics. Prereq: Consent of instructor.

517-18 Mathematical Methods in Physics (3,3) (Same as Physics 519-60) Fourier series, partial differential equations, wave, heat, and linear algebra, fields and graphs. Prereq: 447, and 453, or consent of instructor. 518 Mathematical Methods in Physics: Nonlinear Waves (3,3) Nonlinear waves, particle waves, and solitons. Prereq: 448 and 454 or 404, or consent of instructor.


539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


548 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

550 Matrix Algebra (3) Advanced topics in matrix theory: decomposition theories and algorithms for matrices with special structure. Prereq: 453 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; metricization; homeomorphic invariants of point sets. Prereq: 455-56 or consent of instructor. 561-62 Topology (3,3) Topological spaces; metricization; homeomorphic invariants of point sets. Prereq: 455-56 or consent of instructor. Prereq: 453 or consent of instructor. 569 Seminar in Topology (1-3) May be repeated. Maximum 12 hrs.


575 Matrix Theory and Techniques in Numerical Analysis (3) Advanced topics in study of iterative and direct methods for large systems of linear equations: sparse matrix analysis, relationship to modern computer architectures. Prereq: 453, 471-72, or consent of instructor. May be repeated. Maximum 9 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 ecology. Prereq: 431, 453 or consent of instructor.

584 Mathematical Systems Theory (3) Analytic approach to discrete and continuous dynamical control systems; optimal control; Applications to ecology. Prereq: 431, 453, 445-46 or consent of instructor.

585 Optimal Control Theory (3) Deterministic optimal control. Examples involving calculus of variations, optimal control. Applications to ecology. Prereq: 453, 471-72 or consent of instructor. May be repeated. Maximum 9 hrs. (Same as Computer Science 575.)

591 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

599 Independent Study (1-15) See page 32.

600 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 8 hrs.

601-02 Seminar in Numerical Mathematics (1-3) May be repeated. Maximum 12 hrs.


619 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.

623-24 Advanced Probability (3,3) Selected topics in modern theory of probability and stochastic processes: Ito's calculus and stochastic differential equations, integration prediction theory, ergodic theory, probability on abstract spaces, limit theorems, appropriate probability in everyday life, applications in finance, insurance, and operations research. Prereq: 431, 453, 474-75 or consent of instructor. May be repeated. Maximum 12 hrs.

625-26 Approximation Theory (3,3) Theory of best approximation of functions in normed spaces, harmonic analysis, splines, numerical quadrature and orthogonal polynomials. Prereq: 431, 453, or consent of instructor.

631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced viewpoint. Prerequisites from current literature. Subject matter varies according to interests and preparations of students. Prereq: 531-32 or consent of instructor. May be repeated. Maximum 12 hrs.

635-36 Advanced Partial Differential Equations (3,3) Selected topics in classical and modern theoretical partial differential equations. Prereq: 541-42 or 547-48 or consent of instructor. May be repeated. 12 hrs.


646-47 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

651-52 Advanced Modern Algebra (3,3) Selected topics in modern algebra or number theory. Prereq: 551-52 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

659 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated with consent of department. Maximum 12 hrs.


663-64 Algebraic Topology (3,3) Homology, cohomology, and homotopy theories; duality theorems and applications, K"unneth 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.


669 Seminar in Topology (3) May be repeated with consent of department. Maximum 12 hrs.


679 Seminar in Numerical Mathematics (1-3) May be repeated with consent of department. Maximum 12 hrs.

681-82 Advanced Mathematical Ecology (3,3) Selected topics in theoretical and applied mathematical ecology: population, community, ecosystem ecology and applied theory such as demography, ecotoxicology, epidemiology, environmental change, and resource management. Prereq: 581-82. May be repeated.

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**Mechanical and Aerospace Engineering**

**College of Engineering**

**MAJORS**

- **Aerospace Engineering**
  - M.S., Ph.D.
  - M.S., Ph.D.

- **Mechanical Engineering**
  - M.S., Ph.D.

- Donald R. Pitts, Head
  - A. J. Edmondson, Associate Head

**DEGREES**

- **Aerospace Engineering**
- **Mechanical Engineering**

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**Graduate Programs with Majors in Mechanical Engineering and Aerospace Engineering**

Graduate programs with majors in Mechanical Engineering and Aerospace Engineering are available that lead to the degrees of Master of Science and Doctor of Philosophy with concentrations in mechanical engineering and aerospace engineering. These programs allow students to specialize in areas such as materials science, thermal sciences, fluid mechanics, and control systems, among others.

**Programs Offered**: Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Aerospace Engineering, Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Mechanical Engineering.

**Areas of Study**: Aerospace Engineering offers concentrations in materials science, thermal sciences, fluid dynamics, and control systems, whereas Mechanical Engineering offers concentrations in structural mechanics, thermal sciences, and control systems.

**Admission Requirements**: To qualify for admission to these programs, applicants must submit a completed application, transcripts from all previous institutions attended, letters of recommendation, and a statement of purpose. Additional materials may be required depending on the specific program.

**Program Contacts**: For more information, please contact the Department of Mechanical and Aerospace Engineering at [contact information provided].
THE MASTER'S PROGRAM

Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options are available.

Thesis Option

The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 24 semester hours of coursework that includes at least 12 semester hours of graduate (500 level or above) courses in the department with at least 6 semester hours in the major and normally 6 semester hours of coursework (400 level or above) in mathematics. No more than 3 semester hours of engineering coursework may be below the 500 level.
2. 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 or, at the time of completion of the degree requirements, have had at least three years of full-time engineering experience since receiving the Bachelor of Science degree. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:

1. A minimum of 30 semester hours of coursework that includes at least 18 semester hours of graduate (500 level or above) courses in the department with at least 12 semester hours in the major and normally 6 semester hours 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 department with at least 6 semester hours in the major and normally 6 semester hours of coursework (400 level or above) in mathematics. No more than 3 semester hours of engineering coursework may be below the 500 level.
2. A minimum of 6 semester hours in 590 Selected Engineering Problems. A written report must be presented for each problem investigated.
3. Participation in the departmental seminar program.
4. Passing a comprehensive written final examination on all coursework submitted for the degree and an oral examination on all work (including problems).

THE DOCTORAL PROGRAM

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds.

The student must satisfactorily complete an approved program of study that includes 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 department in courses numbered 500 and above, with at least 12 of these semester hours in the major. A minimum of 9 semester hours of courses is required at the 600 level. These are exclusive of thesis, problems, or dissertation credit. The student's advisory committee can approve a student's petition to replace one 600-level course with one or more 500-level courses(s) that are more appropriate.
4. Participation in the departmental seminar program.
5. The passing of a written and oral comprehensive examination is required as well as a successful defense of the dissertation.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Aerospace Engineering is available to residents of the states of Arkansas, Kentucky, or South Carolina. The M.S. in Aerospace Engineering is available to residents of Kentucky 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

Senior (400-level) mechanical and aerospace engineering courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may not normally use more than one 400-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

Mechanical Engineering

NOTE: Not all the courses listed below are available at both the UT Knoxville and the UTSI campuses.

GRADUATE COURSES

422 Environmental Noise (3) Basic principles of acoustics, measurement and control of noise in industrial and community environments. Senior standing in engineering or consent of instructor.
451 Systems and Controls (3) Analytical models of physical systems comprised of combinations of mechanical, fluid, electrical, and thermal components; feedback control systems, transient and frequency response, stability analysis; non-linear control of linear systems; sampled data systems; digital filters. Prereq: Mechanical Engineering Instrumentation and Measurement, Circuits and Electro Mechanical Components. F
455 Introduction to Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering systems; design in team design effort; design report. Prereq: Dynamics and Vibrations of Machines. F
456 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliability, patents and product liability; design of mechanical engineering systems; participation in team design effort; design report. Prereq: 332, 344. F
469 Machine Design (4) Design of complete machine; documentation, complete specifications, design calculations, working drawings, and cost analysis. Written and oral report. Prereq: 455, 466. Sp
471 Refrigeration and Air Conditioning (3) Vapor compression and absorption cycles, heat pump systems; psychometric processes; air washers, cooling towers, solar radiation, building heat transmission. Prereq: 332, 344.
474 Solar Energy Utilization (3) Nature and availability of solar radiation; design of solar energy systems; design analysis of solar energy collectors and methods of storage; selected applications. Prereq: 332, 344, or consent of instructor.
475 Thermal Engineering (3) Thermal systems, turbomachinery, heat exchangers, combustion and system analysis and design, second law and economic analysis. Prereq: 332, 344. F, Sp
479 Thermal Engineering Design (4) Design of complete thermal-fluid system, economic, technical and optimization aspects. Participation in team design effort, formal presentations and design report. Prereq: 456, 475. Sp
494-95 Selected Topics in Mechanical Engineering (1-4, 1-4) Problems and topics related to developments and practice in mechanical engineering. Prereq: Consent of instructor. E
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time, or when degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
507 Application of Numeric Linear Algebra in Systems and Control Engineering (3) (Same as Chemical Engineering 507 and Electrical and Computer Engineering 507.)


514 Phase Change Heat Transfer (3) Mechanisms and modeling of nucleate, transition and film boiling processes; critical heat flux; nucleate and post dry-out heat transfer; condensation processes; heterogeneous nucleation; dropwise and filmwise condensation; flow condensation; liquid-solid phase change processes; moving phase fronts; mathematical modeling. Prereq: 534, 511.


523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instructor.

525 Combustion and Chemicaly Reacting Flows I (3) Fundamentals: thermochrmy, chemical kinetics and conservation equations; phenomenological approach to laminar flows; diffusion and premixed flame theory; single droplet combustion and detonation theory; stabilization of combustion waves in laminar streams; flammability limits of premixed laminar flames; introduction to turbulent flames. Prereq: 522, 531.

526 Combustion and Chemicaly Reacting Flows II (3) Advanced topics: phenomenological approaches to turbulent flames; fundamentals of turbulent flow; application of probability density functions to turbulent flames; turbulent reacting flows with premixed and non-premixed reactants; spray combustion models; fluidized bed combustion; chemically reacting boundary layer flow; gas turbine and/or rocket motor combustors; radiation; introduction to supersonic combustion and hypersonic flows. Prereq: 525.

531 Fluid Mechanics (3) Derivation of equations governing flow of viscous fluid (conservation of mass, Newton's law of conservation of energy) using vector and Conservation of state vector and Cartesian tensor notation. Equations of state and constitutive relations. Specialization of governing equations to those of the incompressible, of the incompressible, of a Newtonian fluid. Appropriate initial and boundary conditions. Exact solutions. Introduction to boundary layer flows, potential flows, low Reynolds number flows. Prereq: 341, Aerospace Engineering 551.

551-52 Mechanical Engineering Design (3,3) Design of mechanical engineering systems and devices. Prereq: Consent of instructor.

553 Development of Superior Products and Processes (3) Case studies of latest techniques of superior product and process development practiced in industry. Case study of systematic design process and results developed by student. Prereq: B.S. in Engineering or consent of instructor.


560 Computer Aided Mechanical Design (3) Applications of matrices and computational techniques in static and dynamic analysis and re-design of complex, three-dimensional, statically indeterminate structure. Prereq: 569 and 484 or consent of instructor.

567 Dynamics of Machinery (3) Kinematics and kinet- ics: fixed, moving and rotating co-ordinate systems; linear and angular momentum; energy methods; computational techniques derived from Lagrangian and Hamiltonian mechanics; variable mass; rigid body dynamics. Prereq: 363, 391.

569 Vibrations (3) Free and forced vibration of single and multiple degree of freedom systems linear and nonlinear. Prereq: Undergraduate vibrations course.

571 Metal Machining and Forming (3) Mechanics of cutting and behavior of high strength materials. Analysis of Friction of tool wear and effects of temperature. Selection of cutting fluids and tool materials; chip control; Mosturbation, forging, and bending. Prereq: Introductory materials engineering course, undergraduate heat transfer.

581 Rocket Propulsion I (3) Rocket propulsion fundamentals; thermodynamics of nonreacting and chemically reacting ideal gases, rocket nozzle design; ideal 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 additive on solid propellant burn rates, erosive burning; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion. Thermodynamics of electrical resistance and electric fields (ion) engine performance, magnetohydrodynamic thrusters, traveling wave thrusters; exotic propulsion systems. Prereq: Consent of instructor.

584-85 Turbo/machinery Systems I, II (3,3) Ideal cyclic analysis of turbomachinery engines, real cyclic analysis, component performance analysis, component design and systems integration (inlets, nozzles, combustors, compressors, turbines, flow systems, component matching, transient operation, surge and rotating stall, engine control systems, structural considerations. Prereq: First year graduate standing and consent of instructor.


595 Measurement Science I (3) (Same as Nuclear Engineering 568, Aviation Systems 568, Chemical Engineering 568, Civil Engineering 568, Electrical and Computer Engineering 568, Engineering Science and Mechanics 568, and Aerospace Engineering 568) Principles of measurement. Prereq: Consent of instructor.

590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor. May be repeated. S/NC only.

596 Seminar (1) All phases of mechanical engineering, reports on current research at UTK. May be repeated. S/ NC only.

599 Special Topics in Mechanical Engineering (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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

610 Advanced Topics in Fluid Mechanics and Heat Transfer (3) Advanced theory and application of fluid mechanics and heat transfer; natural convection, multi-phase flow, high speed reactive and nonreactive flows, advanced boundary layer techniques, combustion, per- turbation and variational methods of analysis, heat exchanger theory and design, and heat transfer. Prereq: Consent of instructor. Maximum 9 hrs. Prereq: Consent of instructor.

611 Advanced Convection Heat Transfer, Fluid Me- chanics and Mass Transfer (3) Stagnation point and high speed viscous boundary layer flows; problems in heat transfer at high temperatures, hypersonic flows; laminar and turbulent boundary layer heat transfer with surface melting, ablation, sublimation; effects of gas species recombinanion; stagnation point heat transfer, Lee's integral solution for high speed boundary layers; heat flux scaling rules; mass transfer and radiation cooling techniques. Prereq: 512 and consent of instructor.


513 Advanced Radiation Heat Transfer (3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection of matter. Prereq: 511, 512.


Aerospace Engineering

NOTE: Not all the courses listed below are available at both the UT Knoxville and the UTSI campuses.

GRADUATE COURSES

422 Aerodynamics (3) Theory and design of aero- dynamic devices for desired airflow. Potential flow, viscous flow theory, viscous effects, compressibility effects. Sub- sonic, transonic, and supersonic airfoils. Prereq: 370 F

423 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods. Prereq: 422 or Heat Transfer or consent of instructor. F

424 Astronautics (3) Propulsion, trajectories, guide- ance, control, and atmospheric reentry of space vehicle systems. Prereq: 362, Mechanical Engineering 332. Sp

425 Propulsion (3) Principles of propulsion devices; turbo-jet, ram jet and rocket engines. Prereq: 351. F


429 Aerospace System Design (4) Synthesis and design of complete aerospace system, economic and technical aspects. Participation in team design effort, formal presentations and design report. Prereq: 425, 426, Sp.

449 Aerospace Engineering Laboratory (3) Designing, constructing, testing and analyzing experiments. Test standards and specifications. Analysis of data and formation of conclusions. Prereq: 345, 351, 3 labs. F

449-95 Selected Topics in Aerospace Science (1-1, 1-4) Current problems and topics in aerospace science. Prereq: Consent of instructor.

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

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

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping; complex variables. Prereq: Mechanical Engineering 531, Math- ematics 425 or equivalent.

512 Viscous Flow (3) Equations of viscous fluid flow; laminar and turbulent flow; transition, separation; boundary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 531 or equivalent.

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; experimental apparatus; heat wire anemometry and
515-16 Air Vehicle Aerodynamics and Performance (3,3) Application of aerodynamics principles to air vehicles to provide estimates of performance, stability, and control characteristics under subsonic, hypersonic, and supersonic speeds. Relations among thrust, drag, lift, and attitude, propulsion system, vehicle performance characteristics, and trajectory optimization. Prereq: 422, 515 for 516.

521-22 Aerodynamics of Compressible Fluids (3,3) One-dimensional internal and external flow waves; small perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 422 or 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: 522.

527-28 Aerospace Ground Test Facilities (3,3) At-free molecule and rarefied gas flow. Prereq: 512.

531 Magnetohydrodynamics (3) Electromagnetic field theory, chemical kinetics; thermodynamic and thermophysical properties of gas plasma; 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 plumes. Prereq: 522.

534 Atmospheric Entry (3) Reentry trajectories, lift and drag during reentry; vehicle motion and stability during reentry; aerodynamic heating and heat protection systems. Prereq: 522. Recommended prereq: 512.

539 Rarefied Gasdynamics (3) Binary elastic collisions; kinetic theory; flow regimes; Boltzmann and model equations, transfer equation, gas-surface interactions; slip boundary conditions, free molecule, slip and transition flow, rarefaction; simulation; experimental techniques; introduction to hypersonic real gas flows. Prereq: 522. Mechanical Engineering 522.


561-62 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 flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 561 or equivalent.

611 Advanced Aerodynamics (3,3) Subsonic, transonic, supersonic, and hypersonic flows treated in generalized and unified manner with combined viscous/inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations, and foundations of gas dynamics, applications to airplane, rocket, ground testing and jet propulsion. Discussion of special topics according to interest of students. Prereq: 511, 522.

645 Theory of Turbulence (3) Same as Engineering Science and Mechanics 645.

651-62 Advanced Aerodynamics (3,3) Subsonic, transonic, supersonic, and hypersonic flows treated in generalized and unified manner with combined viscous/inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations, and foundations of gas dynamics, applications to airplane, rocket, ground testing and jet propulsion. Discussion of special topics according to interest of students. Prereq: 511, 522.


690 Advanced Topics in Aerospace Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

574 Space Engineering: Satellite Technology (3) Satellites and rockets (orbit, launch vehicles and launching), spacecraft structure, power systems, attitude control system, interface, and communication links, spacecraft testing, reliability, and application of satellites (communication, weather, Earth observation, and future applications). Prereq: 425, Mathematics 471, 404.


590 Selected Engineering Problems (2-4) Enrollment limited to students in programs program. Prereq: Consent of advisor.

595 Seminar (1) All phases of aerospace engineering, research on current research at UTK. May be repeated. S/NC only.

599 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 6 hrs.

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

613 Magnetohydrodynamics (3) Electromagnetic field equations, motions of single charged particle, statistical description of plasma, Boltzmann equation, conduction and diffusion in ionized gases, continuum magnetohydrodynamic equations. Prereq or coreq: 512. Prereq: Mathematics 561 or equivalent.

632 Magnetohydrodynamics II (3) Alfvén and shock waves, exact solution for magnetohydrodynamic channel flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 631 and Mathematics 562.

641-42 Physical Gas Dynamics (3,3) High speed, high temperature gas flow from molecular point of view. Kinetic theory, statistical mechanics, equilibrium flow, vibrational and chemical rate processes, non-equilibrium flow, one-dimensional model of channel flow, engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 561 or equivalent.

645 Theory of Turbulence (3) Same as Engineering Science and Mechanics 645.

Medical Biology

(Graduate School of Medicine-Medical Center Knoxville)

Carmen B. Lozio, Acting Chair

Professors:

Carroll, R., Ph.D. ............................................. Cornell
Chen, J., Ph.D. ............................................. Penn State
Congdon, C. G. (Emeritus), M.D. ....................... Michigan
Farkas, W., Ph.D. ......................................... Duke
Fuhr, J. E., Ph.D. .......................................... St. John's
Ichik, A. T., Ph.D. ............................................ UCLA

Lange, R. D. (Emeritus), M.D. ............................... Washington (St. Louis)
Lozzio, Carmen B., M.D. ................................. Buenos Aires
McDonald, T. P., Ph.D. ..................................... Tennessee
Wigler, P. W., Ph.D. ......................................... California
Wust, Carl J., Ph.D. .......................................... Indiana

Assistant Professors:

Goodman, M. M., Ph.D. ..................................... Alabama
Hanna, W. T., M.D. ........................................... An-Marsh
Matteson, K., Ph.D. ......................................... Wisconsin
Schroeder, E. G., D.V.M. .................................. Michigan State
Wimalasena, J., Ph.D. ...................................... Colorado

Assistant Professors:

Karstad, M. D., Ph.D. ..................................... Loyola
Potter, N. T., Ph.D. ......................................... Duke
Switzer, R. C., III, Ph.D. .................................... Michigan State
Tyler, J., Ph.D. ................................................. SUNY Buffalo

The Department of Medical Biology of The University of Tennessee Graduate School of Medicine was formed from the faculty of The University Hospital in 1978. The Research Center was established in 1956. The faculty has research, education, and service interests in cancer, blood diseases, metabolism, toxicology, neuroscience, birth defects, cyto genetics, and clinical genetics. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine.

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. in Comparative and Experimental Medicine. Other advanced degree students can do thesis research in the department by arrangement with other life science departments at the University.

GRADUATE COURSES

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

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

556 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/NC only. E

521 Principles of Oncology (3) Lectures, classroom discussion, and case reports surveying major topics of oncology. Prereq: Biology 220-30 or consent of instructor.

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. Nutrition 410 and 420.


541 Molecular Basis for Metabolic Disease (4) Disease at molecular level. Changes in molecular events in cells that lead to disease and occur in result of disease. Correlation with clinical and pathological states. Prereq: Biochemistry 410-419 or equivalent. F,Sp

543 Metabolism of Drugs (1) Drug mechanisms of action: membrane transport, enzyme reactions, ionization, stereoisomerism and metabolic pathways. For stu-
ADMISSION REQUIREMENTS

Students are expected to have completed an undergraduate program with a 3.0 or better GPA on a 4.0 system. Included in the undergraduate course credits should be: (1) a full year of general biological science, (2) one year of calculus, (3) two years of chemistry, including one year of organic, (4) one year of physics, and (5) an introductory course in microbiology. In many cases, deficiencies in requirements may be removed by taking appropriate courses during the first year of graduate study. The department also requires the general portion of the Graduate Record Examination. A satisfactory score on each part is 550 or higher with rare exceptions. Three letters of recommendation should be submitted by current or former faculty members.

Each new graduate student meets with an advisory committee chaired by the departmental Director of Graduate Studies to plan a program of study for the first one or two semesters until a research advisor is selected. All first-year students participate in a laboratory rotation program during the first semester of study. This program allows the student to adjust smoothly to the research programs of the department, to develop a background of research procedures and concepts, and to facilitate the selection of a research professor. Usually, the student selects a research professor toward the end of the laboratory rotation period. The major professor assists in the selection of and carrying out of a suitable research program and in the naming of a thesis or dissertation committee.

THE DOCTORAL PROGRAM

The program leading to the Ph.D. is designed to provide the student with broad basic knowledge, to develop 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 and (3) 12 hours of credit have been earned in courses graded on the A-F system; (3) a 3.0 GPA in courses taken in the department; (4) a complete course sequence in biophysics; (5) coursework in at least five of the subdisciplines recognized by the department: microbial physiology, pathogenic bacteriology, virology, mycology, immunology, microbial genetics, microbial ecology, molecular biology, and applied microbiology; and (6) presentation of a research thesis and its oral defense.

THE MASTER'S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge, to develop 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 and (3) 12 hours of credit have been earned in courses graded on the A-F system; (3) a 3.0 GPA in courses taken in the department; (4) a complete course sequence in biophysics; (5) coursework in at least five of the subdisciplines recognized by the department: microbial physiology, pathogenic bacteriology, virology, mycology, immunology, microbial genetics, microbial ecology, molecular biology, and applied microbiology; and (6) presentation of a research thesis and its oral defense.
Microbiology - Veterinary Medicine

See Veterinary Medicine for program description.

Music

(College of Liberal Arts)

MAJOR DEGREES

Music............................... M.M.

Kenneth A. Keeling, Sr., Head

Professors:

Bali, Charles H., Ph.D. ......... Peabody
Bitzas, George C., M.M. ..... Converse
Brook, John P. (Liaison), M.M. .... Alabama
Carter, W. J. (Emeritus), D.M.A ..... Eastman
Coker, J. M.A. .................... Sam Houston
Combs, F. M., M.A. ............. Missouri
Devine, George F. (Emeritus), Diploma ......... Schurz
Dorn, W. (Emeritus), M.A. ......... Columbia
Fred, Herbert W. (Emeritus), Ph.D. ........ North Carolina
Hofford, A. G. (Emeritus), M.M. .... Northwestern
Huber, Calvin R., Ph.D. ......... North Carolina
Julian, W. J., Ph.D. .............. Northwestern
Keeling, Kenneth A., Sr., D.M.A .... Ohio
Meadham, John J., M.M ......... Northwestern
Moore, M. C., Ph.D. ............. Michigan
Northington, D. B., D.M.A ....... Yale
Pederson, D. M., Ph.D. .......... Iowa
Starr, W. J. (Emeritus), M.M ......... Eastman
Stutzenberger, D. R., D.M.A ....... Maryland
Tips, A. W., Ph.D. .............. Michigan
Van Vactor, D. (Emeritus), M.M .... Northwestern

Associate Professors:

Adams, F. M., M.M ............ Tennessee
Bommellje, W., M.M .......... Tulsa
Carter, P. S., M.M ............. Colorado
Horodysky, P., M.M .......... Manhattan
Hough, Don, M.M .......... Tennessee
Hough, Dolly C., M.M ......... Texas
Jacobs, W. B., D.M.A ......... Stanford
Johnson, A. E., D.M.A ........ Washington
MacMorran, W. S., M.M ....... Wisconsin
McClelland, D., M.A ........... Columbia
McDaniel, Walter H. (Emeritus), M.S. .... Tennessee
Michalopulos, L. W., M.A ....... Columbia
Mintz, J. C., Ed.D. ............ Columbia
Scarlett, William P., M.M .... Louisiana State
Searle, S. M., M.M .......... Tennessee
Sparks, J. R., M.S. .............. Tennessee
Teachey, J. C., D.M.A .......... Florida State
Young, S. E., Ph.D. ............ North Carolina

Assistant Professors:

Boling, M. E., M.M ............. Tennessee
Brown, Donald R. .......... Delaware
Dubbertly, T. S., M.M ....... Yale
Erwin, A. Y. , M.M ............ Southern California
Hawthorne, W., Ph.D. ......... Cincinnati
Leach, C. F., M.M .......... New Mexico
Rook, Patricia, M.A ............ Washington State
Sper, G. R., M.M .......... Indiana

The Department of Music offers the Master of Music degree with concentrations in accompanying, choral conducting, composition, instrumental conducting, jazz, music education, musicology, performance (organ, piano, strings, voice, winds, and percussion), piano pedagogy and literature, sacred music, string pedagogy, and theory. Applicants must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UT Knoxville, appropriate to the applicant's prospective area of concentration on the Master's level. Applicants who plan to pursue the concentration in performance or music education are required to audition before the appropriate area faculty committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. Applicants for the concentration in jazz must audition in jazz improvisation and jazz piano

proficiency and interview with members of the faculty in this area. Other applicants are required to have an interview with members of the faculty of the prospective area of concentration.

All applicants are required to take the Diagnostic Examinations in music theory an music history/literature. These examinations are given by the Department of Music at the beginning of each semester.

THE MASTER'S PROGRAM

A minimum of 30-33 semester hours of coursework is required for the Master of Music degree. These hours are specifically distributed according to the area of concentration. All concentrations require coursework in music history/literature and music theory and allow for elective courses. Specific curricula are available from the department.

The graduate recital is given in lieu of thesis by students with concentrations in performance, pedagogy, jazz, and accompanying. A performance project is given in lieu of thesis by students with concentrations in choral conducting, instrumental conducting, and sacred music. A thesis is required of students in composition, musicology, and theory.

All concentrations require a written and oral final examination.

Concentration in Music Education

The concentration in music education is designed for persons who hold a Bachelor's degree in Music or Music Education and certification to teach music in the public schools. Students seeking initial certification must consult the requirements for the Master of Science degree in the College of Education. The program requires 510 and 520; 9 hours of music education electives at the 500 level; 6 hours of Thesis 500; 6 hours of 500-level courses in music theory or history; 2 hours of applied music at either the 400 or 500 level; 2 hours of music ensemble at the 500 level; and 3 hours of electives at the 500 level.

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

Diagnostic tests in theory, ear training, and music history will be required.

Music Education

GRADE POINT REQUIREMENTS

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 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 suit-
Music Ensemble

GRADUATE COURSES

501 Woodwind Choir (1) May be repeated.
502 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 Tubas Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Marimba Choir (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.
550 Concert Band (1) May be repeated.
552 Campus Band (1) May be repeated.
554 Varsity Band (1) May be repeated.
556 Laboratory Band (1) May be repeated.
558 Marching Band (1) May be repeated.
570 Symphony Orchestra (1) May be repeated.
580 Concert Choir (1) May be repeated.
582 University Chorus (1) May be repeated.
583 Men's Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Music History

GRADUATE COURSES

410 Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.
420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools, 1600-present.
430 Symphonic Literature (3) Literature for orchestra from Baroque to present, evolution of symphony.
440 Music of North America (3) Folk and art music of U.S. and Canada from colonial times to present.
450 Composer Seminar (3) Life and works of single composer. Subjects vary.
460 Music Aesthetics (3) Nature of music and musical experience, sense perception and emotions, music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.
480 Music in Christian Worship (3) Hymnody, liturgies, and liturgical music.
490 Church Music Methods and Administration (3)
510 Music Bibliography (2) Bibliographic methodology in music.
520 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.
540 Music in the Baroque Period (3) From c. 1600 to 1750; rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.
560 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.
570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.
580 Music in the Twentieth Century (3) From 1890, Debussy, to present, Stockhausen and others.
590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.
593 Independent Study (1-15) See page 32. Prereq: Consent of department head.

Music Instrumental

GRADUATE COURSES

490 Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to conductor's art; musical analysis and practice in conducting. Prereq: Music Education 320 or equivalent.
570 Advanced Suzuki Pedagogy (2) Study of psychology, procedures and literature utilized by Shinichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.
580 Band Literature (3) Band literature and origins of band, its important extended 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.
520 Seminar in Jazz (3) Topic varies.

Music Keyboard

GRADUATE COURSES

420-30 Piano Literature I, II (3, 3) 420--From 1750 to middle 19th century; 430--Middle 19th century to present.
460-70 The Organ and Its literature I, II (3, 3) Development of organ and organ literature from Middle Ages to present; problems of style and interpretation; pedagogical, literature and methods; organ design. Prereq or coreq: Music History 220 and consent of instructor.
485-95 Suzuki Piano Method I II (2.2) Psychology, procedures, and literature of Suzuki piano method. Must be taken in sequence. Prereq: Consent of instructor.
520 Piano Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.
531-41 Recital Project (2,2) Preparation and accompaniment of full recital for accompanying concentrations only. 531--Vocal recital, 531--Instrumental recital. Prereq: Consent of instructor.
540-50 Advanced Piano Pedagogy I II (2,2) 540--Evaluation and study of methods and materials for teaching piano at all levels. Supervised laboratory teaching. Prereq: 440, 450, or consent of instructor. 550--Introduction and principles of Kodaly, Orff, Suzuki, Dalcroze, Eurhythmics, and class piano teaching. Prereq: 440, 450, or consent of instructor.
560 Organ Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

Music Performance

GRADUATE COURSES

All performance courses require an audition and consent of instructor. May be repeated. Maximum 5 hrs toward M.M. degree.
Music Voice

GRADUATE COURSES

510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

520 Music Theatre Performance Techniques (1) Improvisation, movement, and basic techniques for dramatic vocal performance. Prereq: Vocal major or consent of instructor. May be repeated for credit. Maximum 2 hours.

530 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

550-60 Advanced Vocal Pedagogy (2, 2, 2) Study of vocal production, examination of different methods, study of teaching materials, observation of studio teaching, analysis of vocal problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature 1, 1, 1 (2, 2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document; recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR

Nuclear Engineering M.S., Ph.D.

Thomas W. Kerlin, Head

Professors:

Dodds, H. L., PE, Ph.D. Tennessee

Kerlin, T. W. (Liaison), Ph.D. Tennessee

Mihalco, J. T., Ph.D. Tennessee

Miller, L. F., PE, Ph.D. Texas A&M

Perez, R. B., Ph.D. Madrid

Stevens, P. N., PE, Ph.D. Northwestern

Uhrig, P. E. (Distinguished Prof.), PE, Ph.D. Iowa

Upadhyaya, B. R., Ph.D. California

Associate Professors:

Groer, P. G., Ph.D. Vienna

Katz, E. M., PE, Ph.D. Tennessee

Scott, T. H., PE, Ph.D. Florida

Assistant Professor:

Ruggles, A. E., Ph.D. Rensselaer

The Department of Nuclear Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Students may elect a traditional nuclear engineering M.S. or Ph.D. program (focusing on fission energy or fusion energy) or a radiation protection engineering concentration at the Master's level. The radiation protection engineering concentration prepares students for careers in the radiation safety field (health physics). The program is designed for graduates of undergraduate programs in engineering, physics, biology and chemistry.

THE MASTER'S PROGRAM

A graduate program leading to the Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program.

The student must complete 24 semester hours of coursework approved by the student's advisory committee that includes the following:

1. A major consisting of a minimum of 12 semester hours of graduate courses in nuclear engineering. This must include at least one of the following two-semester sequences: 511, 512; 551, 552; 563, 564; 571, 572.

2. A minor of 6 semester hours of elective courses in mathematics, statistics or computer science.

3. Six semester hours in either nuclear engineering or a related field. The M.S. candidate must also demonstrate research or design capability. This requirement may be satisfied by a thesis project or engineering practice projects as described below.

Thesis - The student performs independent research on a topic approved by the graduate committee. He/she submits a thesis on this research. The student then must pass an oral examination on the thesis and all graduate coursework. The student must enroll for six semester hours of NE 590 (Thesis).

Engineering Practice - The student performs independent research on two to four separate topics approved by his/her graduate committee. Each project is similar to a thesis project but smaller in scope. He/She submits a report, in thesis format, on each project. The student must then pass an oral examination on his/her engineering practice reports and all graduate coursework. The student must enroll for six semester hours of NE 598 (Nuclear Engineering Practice).
THE DOCTORAL PROGRAM

Students in the field of nuclear engineering desiring to study for the Doctor of Philosophy must have a Bachelor of Science or Master of Science from a recognized university, with a major in engineering or physics. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, physics, and nuclear engineering.

Specific course requirements for the Ph.D. in Nuclear Engineering include:

1. A minimum of 48 semester hours beyond the Bachelor's degree, exclusive of credit for the M. thesis or Nuclear Engineering Practice.

2. A minimum of 24 semester hours in doctoral research.

3. A minimum of 30 semester hours in nuclear engineering courses numbered 500 and above (or the equivalent), with at least 9 semester hours of 600-level courses. These are exclusive of thesis or dissertation credit.

4. A minimum of 12 semester hours in mathematics, computer science, or statistics courses beyond nuclear engineering undergraduate requirements numbered 400 or above.

5. A minimum of 6 semester hours in courses numbered 500 or above offered by a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.

6. A reading knowledge of one foreign language may be specified by the student's doctoral committee.

The comprehensive examination is prepared by the nuclear engineering faculty and consists of 12 hours of written examinations. All past examinations are filed in the library, and students are encouraged to review them. Students are invited to take the comprehensive examination after completing approximately 30 semester hours of coursework. A student who fails the written part of the examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. Registration for NE 600 is permitted until the written examination is passed. The comprehensive examination is completed with a successful oral defense of the dissertation proposal.

A candidate must successfully defend, in an oral examination, all work presented for the degree—all coursework and the dissertation.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Nuclear Engineering is available to residents of the states of Alabama, Kentucky, Mississippi, or South Carolina. 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

403 Nuclear Engineering Laboratory (Cross-section measurement, diffusion properties of neutrons, critical loading experiment, core rod calibration, statistical weight, shielding, xenon poisoning, dynamics and control of experiments. Prereq: Nuclear Engineering Laboratory or equivalent. Coreq: 471, 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.

463 Introduction to Fusion Energy I (3) (Same as Electrical and Computer Engineering 463.)

464 Introduction to Fusion Energy II (3) (Same as Electrical and Computer Engineering 464.)

470 Nuclear Reactor Theory I (3) Fundamentals of reactor physics relative to core sections, kinematics of elastic scattering, reactor kinetics, reactor systems and nuclear data. Analytical and numerical methods applicable to general criticality problems, eigenvalue searches, perturbation theory, and boundary diffusion equations. Prereq: Introduction to Nuclear Engineering.

471 Nuclear Reactor Theory II (3) Thermal spectrum computational methods: heterogeneous effects in fast and thermal spectra; considerations in reactor core design: equations that relate thermal and neutronic variables; power distribution calculations and reactivity control methods. Prereq: 470.

494 Special Topics in Nuclear Engineering (3) Probabilistic safety analysis. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

502 Registration for Use of Facilities (3-15) Required for students matriculated in doctoral programs at UT Knoxville on an in-state tuition basis. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 6 hrs.

511-12 Transport Processes in Nuclear Engineering (3,3) Rheology of non-Newtonian and non-Newtonian fluids; integral and system conservation equations for single and multi-component fluids; in-depth development of differential conservation equations for mass, energy, and momentum; exact and approximate solutions of equations of motion; boundary layer analysis; numerical analysis of fluid flow and heat transfer.

521 Nuclear Systems Dynamics and Control (3) Introduction to state variable 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 the management of fuel assemblies. Prereq: 403 or equivalent.


543 Selected Topics in Nuclear Criticality Safety (3) Criticality safety computational and experimental methods for design, fabrication, fabrication, fabrication, and transport analyses; overview of safety practices and regulatory requirements. Prereq: 421 or consent of instructor.

550 Nuclear Instrumentation (3) Physics and electronics used with radiation detection, methods of data analysis, applicability of particular instrument measurements and fundamentals of nuclear instrumentation operation.

551 Radiation Protection (3) Interactions of photons, neutrons, charged particles, and neutrons with matter and mechanisms of energy loss; methods of radiation detection, internal and external radiation dosimetry; chemical and biological effects of radiation; regulatory standards. Prereq: Introduction to Nuclear Engineering and Differential Equations I or equivalents.

552 Radiation Monitoring and Dose Assessment (3) Methods for work-area and environmental monitoring; dose assessment; pathways analysis; risk projections and regulations. Prereq: 551.

561 Plasma Diagnostics I (3) (Same as Electrical and Computer Engineering 561.)

562 Plasma Diagnostics II (3) (Same as Electrical and Computer Engineering 562.)

563 Plasma Engineering (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology into design of future plasma experiments and reactor designs. Particle, momentum, and energy balance equations. Simulation of various fusion reactor plasmas. Prereq: 464 or consent of instructor. (Same as Electrical and Computer Engineering 564.)

564 Fusion Technology (3) Engineering problems associated with fusion reactor design: vacuum and magnetic systems; materials and irradiation; plasma heating, fueling, and impurity control; review of major design studies. Prereq: (Same as Electrical and Computer Engineering 564.)


572 Nuclear System Design (3) Design and analysis of a nuclear system, interface with non-nuclear aspects of system design: system reliability and economics; closed plant. Prereq: 571 or consent of instructor.

573 Applied Artificial Intelligence (3) Symbolic methods for artificial intelligence with focus on applications to engineering problems. Prereq: Consent of instructor. (Same as Engineering Science and Mechanics 675.)

576 Expert Systems in Engineering (3) Application of expert systems in engineering; logic and rationale, developing 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, moments method, discrete ordinates, adjoint calculations, coupled analysis, and fast reactor shield design. Prereq: 405 or equivalent.

582 Monte Carlo (3) Analysis of radiation transport problems in radiation shielding by Monte Carlo method, description of MORSE code. Random sampling, evaluation of integrals, analog particle transport, techniques of variance reduction, forward and adjoint modes of analysis, importance function biasing, splitting/window survival biasing and accumulation. Prereq: 581.

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.)

Nursing

(College of Nursing)

MAJOR

DEGREE

Nursing --------------- M.S.N., Ph.D.

Joan E. Uhl, Dean
Mildred M. Fenske, Associate Dean and Director of M.S.N. Program
Sandra Thomas, Director of Ph.D. Program

Professors:
Allgood, Martha R., Ph.D.  New York
Goodfellow, Dale H., Ph.D.  Peabody
Mozingo, Johnie N., Ph.D.  Tennessee
Thomas, Sandra P., Ph.D.  Tennessee
Uhl, Joan, Ph.D.  Utah

Associate Professors:
Davis, Mitzi M., Ph.D.  Tennessee
Droppelman, Patricia G., Ph.D.  Tennessee
Fenske, Mildred M.  Vanderbuilt
Jolly, Mary Sue, Ed.D.  Kentucky
McGuire, Sandra, Ed.D.  Tennessee
Overtom, Helen, Ph.D.  Maryland
Sharp, Theresa G., Ed.D.  Tennessee
Shoffner, Dava, Ph.D.  Tennessee
Tuck, Inez, Ph.D.  North Carolina (Greensboro)

Assistant Professors:
Bowen, Sheila, Ph.D.  Tennessee

Kollar, Mary, Ph.D.  Tennessee
Witherington, Carol, 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, and nursing administration.

Admission Requirements
1. Meet requirements for admission to The Graduate School.
2. Hold a Bachelor's degree in Nursing or complete the equivalent of an upper division undergraduate major in nursing in addition to meeting all M.S.N. degree requirements.
3. Have an undergraduate GPA of 3.0 or higher or a GPA of 3.0 for courses in the undergraduate major.
4. Complete the General portion of the Graduate Record Examination. NOTE: A strong performance on this examination may compensate for a GPA lower than 3.0.
5. Complete Graduate Program Data Form.
6. Submit three Graduate School Rating Forms from individuals familiar with the applicant's current work performance or academic aptitude.

Special Requirements
1. Each student must hold personal professional liability insurance.
2. Registered nurses must be licensed to practice nursing in Tennessee.
3. Each student must present proof of a physical examination and rubella immunization or sufficient titer completed within six months of registering for clinical courses.
4. Each student must present evidence of current CPR certification.
5. Non-registered nurse students must have completed 8 semester hours of chemistry or biology, a nutrition, 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

Research (9-12 credits)
--- Graduate level statistics course 3
501 Nursing Research: Methods, Design & Analysis 3
500 Thesis 6
580 Directed Research 3

OR
581 Directed Research 3

Concentration (12 credits)--choose one
530-31 Adult Health Nursing I,II 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
312 Acute Care Nursing Theory 6
402 Family Health Nursing Theory 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 Practicum, 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
414 Community Mental Health Nursing 6

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 nursing course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.
3. If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.

REQUIREMENTS FOR SECOND MASTER'S DEGREE
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 distribution of required nursing courses must be completed:

<table>
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<tr>
<th>Core</th>
<th>Concentration</th>
<th>Research</th>
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<td>12</td>
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<td>6</td>
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**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 doing 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 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:

- 581 Directed Research 3
- 501 Theory Construction & Analysis I, II 6
- 506-6 Nursing Research Seminar 4
- 507 Qualitative Nursing Research 3

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>608</td>
<td>Quantitative Nursing Research 3</td>
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<tr>
<td>611</td>
<td>Advanced Nursing Seminar 2</td>
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<tr>
<td>614</td>
<td>Nursing Preceptorship 3</td>
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<tr>
<td></td>
<td>Statistics 6</td>
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<td></td>
<td>Electives 12</td>
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<tr>
<td>600</td>
<td>Dissertation 24</td>
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<tr>
<td>TOTAL</td>
<td>66</td>
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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 will take the chair of an 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.

**MINOR IN GERONTOLOGY**

Graduate students in the College of Nursing may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to the Human Ecology for specific requirements.

**ACADEMIC COMMON MARKET**

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The Ph.D. program in Nursing is available to residents of the states of Alabama or Arkansas. 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 Nursing Research: Methods, Design, and Analysis (3) Methodology, design, and data analysis issues and their interrelationships in planning, implementation, and evaluation of nursing and health-related research. Investigation of computer applications to data analysis. Prereq or coreq: Graduate level course. 510. F, Sp, Su

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 Holistic Nursing: Wellness (3) Examination of philosophical, 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 holism to nursing of clients with acute and chronic orthopedic disease; mind-body influences and interactions. Prereq: Nursing Assessment and Wellness Promotion and Physiological Principles or equivalents. Prereq or coreq: 503. F

505 Advanced Clinical Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq: 510 or equivalent or consent of instructor. F

509 Graduate Seminar in Public Health (1) (Same as Public Health 505, Nutrition 509, Physical Education 502 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 and management concepts and principles 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, and psychosocial theories to nursing care and management of clients and their families who are experiencing episodes of acute and chronic illnesses and related crises; role of clinical nurse specialist in helping clients and families achieve optimal wellness. Prereq: 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 and application of critical health-related concepts and research to implementation of clinical nurse specialist role. Prereq: 530. 2 hrs and 4 labs. F

533 Directed Study in Technical Nursing Education (3) Philosophy, history and contemporary issues in technical nursing and nursing education; teaching strategies for adult learner in community college; investigation of selected topics. Prereq: Graduate student or consent of instructor. S

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 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. Seminar and clinical practicum: management of chronic health problems in all developmental life stages; role refinement and exploration of major issues in delivery of holistic primary nursing care; clinical experiences in variety of settings. Prereq: 540. 2 hrs and 4 labs. F

550 Parent Child Nursing I (6) Exploration and application of advanced, holistic, and functional nursing, psychological, developmental, environmental, cultural, and other theories, principles, and concepts to child-bearing or child-rearing families in acute care or community settings; family wellness promotion and interventions designed to recognize and respond to threats to wellness of mothers, neonates, children, and adolescents. Prereq: 504. Prereq or coreq: 501, 520. 2 hrs and 4 labs. Sp

551 Parent Child Nursing II (6) Continuation of 550. Seminar and clinical practicum designed to facilitate further development of specialized knowledge and skills used for advanced practice. Role refinement of clinical nurse specialist or nurse practitioner management of women and/or child-bearing or child-rearing families in community, hospital, or other health care settings. Prereq: 550. 2 hrs and 4 labs. Sp

552 Parent Child Nursing Field Work and Seminar (3) Seminar and intensive clinical practicum designed to facilitate further development of specialized knowledge and skills utilized for advanced practice. Role refinement of clinical nurse specialist or nurse practitioner practice in nursing management of women and/or child-bearing or child-rearing families in community, hospital, or other health care settings. Prereq: 550. 2 hrs and 4 labs. Sp

560 Mental Health Nursing I (3) Exploration and application of advanced theories of therapeutic interventions to clients experiencing mental health problems. Options for clinical practice with clients of various age groups in acute care or community settings. Prereq: 504. Prereq or coreq: 501, 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 ad-
585 Seminar in Gerontology (1) (Same as Human 583 Directed Clinical Practice (1-9) Additional opportunities for all MSN candidates who select non-thesis option. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S,Sp.

556 Educational Principles and Strategies (3) Exploration and analysis of selected educational, curriculum, teaching-learning, measurement, and evaluation principles and theories as applied to instruction of undergraduate nursing students, staff development, and patient education. Prereq: Consent of instructor. Sp.

557 Teaching Practicum (1-6) Individually designed teaching experience in collegiate nursing program or nursing practice setting. Objectives to be developed collaboratively by student and faculty. Prereq: or coreq: 564 and consent of instructor. S/NC or letter grade. Sp.

577 Special Topics (1-3) Topic is determined by faculty and student interest. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp.

580 Nursing Project (3) Research-oriented, student-initiated endeavor that culminates in scholarly paper suitable for publication and/or presentation; project may take form of development of innovative nursing intervention program, comprehensive literature review that reflects synthesis or comprehensive analysis, or other formats approved by nursing faculty member. Required for all MSN candidates who select non-thesis option. Prereq: 501, 510. May be repeated. Maximum 6 hrs. F,Sp.

581 Directed Research (3) Exploration of theoretical considerations and research methodologies in nursing research with completion of study under faculty guidance. Prereq: Consent of instructor. May be repeated. 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. Minimum 9 hrs. S/NC or letter grade. E.


593 Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. F,Sp.

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


605-06 Nursing Research Seminars (2,2) Selected topics pertaining to dissertation proposal process, research experience, and defense. Prereq: Completion of core courses. F,Sp.

607 Qualitative Nursing Research (3) Exploration and analysis of philosophical bases, theoretical implications, methods, and data analyses of qualitative nursing research. F.

608 Quantitative Nursing Research (3) Exploration and analysis of philosophical bases, theoretical implications, methods, and data analyses of quantitative nursing research. Prereq or coreq: Graduate level statistics course. Sp.

609 Research Practicum (1-3) Supervised individual or group research experience under guidance of faculty. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC or letter grade. E.

610 Nursing Science Seminar (2) Critical Analysis and synthesis of literature in selected focus area within nursing science. Prereq: Admission to doctoral program in nursing or consent of instructor. Sp.

611 Advanced Nursing Seminar (2) Exploration of historical and current issues of interest to doctorally prepared nurse. Sp.

562 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. F.


614 Nursing Preceptorship (3) Individually designed practicum, field or internship experiences in variety of administrative, educational, research, or clinical practice settings. Prereq: 581, 601, 602, 607, 608, 611. Sp.

615 Advanced Nursing Seminar (2) Exploration of current issues of interest to doctorally prepared nurse. Sp.

571 Nutrition (College of Human Ecology)

MAJORS

NUTRITION ........................................... M.S.

FOODSERVICE AND LODGING ADMINISTRATION ........................................... M.S.

HUMAN ECOLOGY ........................................... Ph.D.

Michael B. Zemel, Head

Programmes:

Nutrition

Foodservice and Lodging Administration

Human Ecology

Associate Professors:

Beauchene, Roy E. (Emeritus), Ph.D. ........................................... Kansas State

Carruth, Betty Ruth, Ph.D. ........................................... Missouri

Quinton, H. W., Ed.D. ........................................... Duke

Sachan, Dileep S., Ph.D. ........................................... Illinois

Smith, John T. (Emeritus), Ph.D. ........................................... Missouri

Zemel, Michael (Liaison), Ph.D. ........................................... Wisconsin

Associate Professors:

Allam, Yousri, Ph.D. ........................................... Tennessee

Brooks, M. D. (Memphis), M.S. ........................................... Alabama

H abduction, B., Ed.D. ........................................... Columbus

Karlstad, M. D., Ph.D. ........................................... Loyola

Nanney, T. M. (Emeritus) ........................................... Washington (St. Louis)

Skinner, Jean D., Ph.D. ........................................... Oregon State

Stevens, Pete, Ph.D. ........................................... Michigan State

Assistant Professors:

Bairley, James W., Ph.D. ........................................... Iowa State

Chencharick, Janet (Memphis), M.S. ........................................... Maryland

Costello, Carol, Ph.D. ........................................... Clemson

McGrath, M. (Liaison), M.S. ........................................... Purdue

Powell, J. A. (Memphis), M.P.H. ........................................... North Carolina

Whelan, Jay, Ph.D. ........................................... Penn State

Zemel, Paula, Ph.D. ........................................... Wayne State

Instructor:

Jones, K., MBA ........................................... East Texas State

Nutrition

Student of Science programs are available in Nutrition and in Foodservice and Lodging Administration. Within the Nutrition program, a student may choose a concentration in nutrition, physiology, statistics and advanced nutrition. Students in public health nutrition must take 511, 512, 513, 514, 515, 541 and the minor in public health. Six hours of Thesis 500, and 8 hours outside the department are required. A minimum of 22 hours at the 500 or 600 level is required.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NTR 511, 512, 540, 541, and 3 hours of graduate level statistics are required. Students in public health nutrition must take 511, 512, 513, 514, 515, 541 and the minor in public health. Six hours of Thesis 500, and 8 hours outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is required for completion of the program.

Foodservice and Lodging Administration

Thesis Option: The program consists of a minimum of 33 hours with at least 18 hours of coursework in the department. NTR 511, 512, 540, 541, and 3 hours of graduate level statistics are required. Students in public health nutrition must take 511, 512, 513, 514, 515, 541 and the minor in public health. Six hours of Thesis 500, and 8 hours outside the department are required. A minimum of 22 hours at the 500 or 600 level is required.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 36 hours with at least 20 hours of coursework in the department. NTR 511, 512, 540, 541, and 3 hours of graduate level statistics are required. Students in public health nutrition must take 511, 512, 513, 514, 515, and the minor in public health. Six hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is required for completion of the program.

The Master's Program

Students may choose a thesis or non-thesis option in Nutrition or Foodservice and Lodging Administration. Attendance at HRA 537 (Foodservice and Lodging Administration) or NTR 540 (Nutrition) is required every semester for the Master's program.

Nutrition

Thesis Option: The program consists of a minimum of 33 hours with at least 18 hours of coursework in the department. NTR 511, 512, 540, 541, and 3 hours of graduate level statistics are required. Students in public health nutrition must take 511, 512, 513, 514, 515, 541 and the minor in public health. Six hours of Thesis 500, and 8 hours outside the department are required. A minimum of 22 hours at the 500 or 600 level is required.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 33 hours with at least 18 hours of coursework in the department. NTR 511, 512, 540, 541, and 3 hours of graduate level statistics are required. Students in public health nutrition must take 511, 512, 513, 514, 515, and the minor in public health. Six hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is required for completion of the program.
service and lodging administration focus on facilities. From this base, students in food-designed environment and management of provided with a foundation of coursework college teaching.

Minimum requirements include:
1. Sixteen hours in nutrition and public health, sociology, statistics, and toxicity.
2. NTR 511, 512, 541, and 2 hours from either 542-544;
3. Four hours of NTR 540, attendance required every semester;
4. Professional seminar, HE 610;
5. Six hours of instruction;
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 for GTAs and NTR 548 comprising a faculty-supervised problem in college teaching.

Consumer Environments
Students enrolled in the Ph.D. program with a concentration in consumer environments are provided with a foundation of coursework relevant to understanding the consumer in the designed environment and management of facilities. From this base, students in food-service and lodging administration focus on areas of specialization in foodservice systems and in lodging administration to further theory and the application of theory in the field. For further information on consumer environments, concentration under Human Ecology.

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

NUTRITION

GRADUATE COURSES
413 Experimental Food Science (3) Individual and group laboratory experimentation in food science; micro-computer applications. Prereq: Science of Food, Plant and Soil Science 471, 1 hr and 2 labs. F

414 Nutrient-Drug Interactions (2) Nutrient effects on efficacy and toxicity of drugs; drug effects on absorption and metabolism of nutrients. Prereq: Fundamentals of Nutrition or equivalent. Sp A

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

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

508 Culture, Food, and Nutrition (3) Food-related behavior of individuals and groups in United States. Sociocultural, economic, and technological influences. Nutrition and food surveys, public policy. Prereq: Nutrition for Educators or Advanced Nutrition or consent of instructor, F A

509 Graduate Seminar in Public Health (1) (Same as Public Health 506, Nursing 509, Physical Education 509 and Social Work 509.)

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: Advanced Nutrition or equivalent. F

512 Human Nutrition (3) Advances in carbohydrates, proteins, fats, minerals, and vitamins. Nutrition require-
ments of humans. Prereq: Advanced Nutrition and 511. Sp

513 Community Nutrition I (3) Orientation to community; assessment of nutrition problems, needs, and resources; functional roles of public health nutritionists. Concurrent field experiences. Prereq: Advanced Nutrition or consent of instructor. F A

514 Community Nutrition II (3) Planning, implementation, and evaluation of public health nutrition programs. Concurrent field experiences. Prereq: 513 or consent of instructor. Sp

515 Field Study in Community Nutrition (1-12) Personal participation in and assessment of regional or state nutrition programs. May be repeated. F A

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during preg-
nancy, infancy, and childhood to age 5, high risk condi-
tions; Prereq: Advanced Nutrition or consent of instruc-
tor. F

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school age children: effects of dietary factors on growth and health maintenance; nutri-
tional assessment and counseling for nutrition. Prereq: Advanced Nutrition or consent of instructor. Sp A

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; effects of nutrition on biological aging. Prereq: Advanced Nutrition or consent of instructor. Su

520 Nutritional Ecology (2) Examination of issues in natural, political, physical, and social environments that impact availability of food and nutrients in U.S. food supply. F A

521 Physiological Basis for Diet and Disease (2) Altered nutrient needs as result of metabolic changes that occur in selected disease states. Prereq: Nutrition in Disease or consent of instructor. Sp

522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of helping process. Prereq: Nutrition in Disease or consent of instructor. Sp

524 Nutrition Education: Principles, Implementation, and Evaluation (3) Conceptual models, principles, application, and evaluation of modes in nutrition education research. Prereq: 506 or consent of instructor. Su A

527 Nutrition in Mental Retardation and Developmental Disorders (1-9) Interdisciplinary diagnosis and development of treatment of developmentally handicapped child; role of nutritionist, clinical experiences and lectures. Child Development Center, UT, Memphis. Prereq: Consent of department head. E

540 Seminar in Nutrition (1) May be repeated. S/N only. E

541 Research Methods (1) Basic principles of planning, conducting, and interpreting nutrition and foodservice systems administration research. Prereq: 6 graduate hrs in nutrition and food system administration and statistics. Sp

542 Advanced Experimental Nutrition (2) Application of research principles to individual project using experi-
mental animals. Prereq or coreq: 541. Sp

543 Human Metabolic Research Methods (2) Application of research principles to constructing and interpreting metabolic study. Prereq or coreq: 541, Sp

544 Food and Nutrition Survey Methods (2) Project for assessment of food consumption, nutrient intake, nutritional status, and sociocultural economic parameters in populations. Prereq or coreq: 541, Sp

547 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. S/N only. E

548 Directed Study in Nutrition (1-3) Advanced study in nutrition. Prereq: Consent of instructor. May be re-
peated. Maximum 6 hrs. E

549 Special Topics (1-3) Recent advances in nutrition or food systems administration. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

600 Doctoral Research and Dissertation (1-15) P/NP only. E

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Prereq: 512 or consent of instructor. May be repeated. F A

603 Current Trends in Food and Sociocultural Change (2) Critical evaluation of research. Prereq: 508 or consent of instructor. F A

Hotel and Restaurant Administration

GRADUATE COURSES
421 Foodservice Systems Design and Equipment (3) Physically designing physical food systems: food system analysis; equipment selection and purchase. Prereq: Quantity Food Procurement, Production and Service with lab or consent of instructor. F A

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

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

530 Computer-Assisted Foodservice and Lodging Management (3) Application of computer technology to foodservice and lodging industry; inventory, cost accounting, production, nutrient analyses, 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, development of budgets, accounting systems and financial reports. Prereq: Food and Lodging Cost Control or consent of instructor. F

532 Advanced Human Resource Management (3) Identifying labor needs, development and maintenance of work forces. Prereq: Food and Lodging Personnel Development or consent of instructor. F

533 Advanced Food Production and Delivery Systems Management (3) Analysis of food production and delivery systems; application of quantitative methods and models to optimize decisions. Prereq: Quantity Food Procurement, Production and Service or consent of instructor. F

534 Special Topics in Foodservice and Lodging Administration (1-3) Lecture-discussion format. Contem-
porary developments and trends in industry. Prereq: Consent of instructor. May be repeated. E

535 Directed Study in Foodservice and Lodging Administration (1-3) Problems selected for study by
The Department of Ornamental Horticulture and Landscape Design offers the Master of Science with concentrations in floricultural science and technology, nursery science and technology, or turfgrass science and technology. Various interests may be emphasized in any of these commodity areas, including micropropagation, innovative production and maintenance systems, computer-aided management systems, and the molecular biology, genetics, histology and stress physiology of ornamentals.

For admission, the student must have a B.S. in ornamental horticulture, turfgrass science, or related agricultural or basic science discipline. Undergraduate transcripts must be evaluated by the department for prerequisite requirements, if any. Graduate research assistantships are available on a competitive basis. For further information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option
1. A thesis is required. A Master's committee of no fewer than 3 faculty members will be selected. Prior to research for the thesis, a proposal must be approved by the Master's committee. Registration for 6 hours of Thesis 500 is required.
2. In addition to the thesis requirement, a minimum of 24 hours of graduate credit is required. Not more than 10 hours of the minimum 30 hours can be below the 500 level. The academic program must be approved by the Master's committee which may require additional coursework if the student's progress or background indicates such need.
3. All students are required to include 510 Research Methods and 2 hours of 590 Seminar in their program and are expected to attend this course and participate in discussions each semester enrolled.
4. Twelve hours of coursework in the major must be at the graduate level, exclusive of Thesis 500.
5. An oral examination covering the thesis and coursework is required.

Non-Thesis Option
1. A Master's committee of no fewer than 3 faculty members will be selected. Twenty-four hours of graduate coursework are required of which 22 hours must be at the 500 level or above.
2. All students are required to include 2 hours of 590 Seminar in their program and are expected to attend this course and participate in discussions each semester enrolled.
3. Twelve hours of coursework in the major must be at the graduate level.
4. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 32 hours of approved graduate work.

GRADUATE COURSES

410 Nursery Management and Production (3) Modern management methods as applied to retail and wholesale nurseries and landscape contracting firms. Methods of producing liners, container and field-grown woody ornamental plants. Prereq: 220, 330, and Plant and Soil Science 210, or consent of instructor. 2 hrs and 1 lab. Sp
440 Advanced Turfgrass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility, and grass nutrition, climatic influences on grass culture; physiology of clipping and water management; design, construction, and management of golf courses; and physiological influences of pest infestation and control measures. Prereq: 340 or consent of instructor. 3 hrs and 1 lab. Sp
451 Plant Tissue Culture (3) (Same as Botany 451.) Comprehensive application of landscape design skills. Design applications involving site layout, landscape grading, applied landscape construction, planting design. Analysis, program drawing, design, detailing, estimating, and specifying applicable to variety of landscape projects. Prereq: 280, 350, and 380, or consent of instructor. 1 hr and 2-3 hr labs. Sp
500 Thesis (1-15) P/NP only. E
501 Special Topics in Ornamental Horticulture and Landscape Design (1-3) Topics to be assigned. May be repeated. Maximum 6 hrs. Prereq: Consent of Instructor. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
550 Microtechnique (3) Methods of investigating histology, histochecmistry, biochemistry, and physiological structures of ornamental and crop plants. Microscopy. Prereq: 8 hrs biological science, 8 hrs chemistry, and consent of instructor. 1 hr and 2 labs. Su
570 Physiology and Development of Ornamental Plants (3) Basic and applied physiology of ornamental plants related to growth and development in production and utilization. Critical review of literature and discussion of juvenile and phase change, flowering, photoperiodism, thermonoposis, vernalization, cold acclimation, hardness, dormancy, growth regulators, environmental stress, and post-harvest consideration. Prereq: Botany 321 and consent of instructor. Sp,A
580 Ornamental Plant Nutrition (3) Applications of nutrition principles and analyses in production of ornamental crops. Comprehensive study of functional roles of nutrients essential to plant growth; critical evaluation of recent developments in nutrient sources and formulations, foliar fertilization and analysis, and nutrient uptake and water relations of ornamental plants grown in containers and in the field. Prereq: Botany 321, Plant and Soil Science 311 and consent of instructor. F,A
590 Seminar (1) Current literature and developments. May be repeated. Maximum 3 hrs. E
593 Problems in Ornamental Horticulture and Landscape Design (1-3) Independent study. Current topic related to technology and science. May be repeated. Maximum 6 hrs. E

Pathobiology

(Major in Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine .................. D.V.M.

Proponents:
Edward D. F. D.V.M. .................. Georgia
McGavin, M. D., Ph.D. .................. Michigan State
Patton, S., D.V.M. .................. Ohio State
Powell, H. S. (Adjunct), D.V.M. ......... Georgia
609 Mechanisms of Disease (4) Advanced topics in pathobiology and mechanisms of disease: pathophysiology, cellular degeneration, inflammation, immunopathology, hemostasis. Principal biochemical and morphologic responses of various cells, tissues, and organs to injury and other metabolic derangements. Selected contemporary topics from current literature and textbooks. Prereq: Consent of instructor. F.A.

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 hours per academic year, 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 (concentration in medical ethics only), Maryland (concentration in medical ethics only), and West Virginia; the Ph.D. program to residents of Oklahoma (concentration in medical ethics only). 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)
546 Clinical Residency in Medical Ethics (3-12) Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics Committee. May be repeated. Maximum 20 hrs. S/NC only.

553 Philosophical Topics in Literature and the Arts (3) Aesthetics, criticism, art and society. May be repeated. Maximum 9 hrs.

560 Philosophy of Natural Sciences (3) Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.


570 Philosophy of Religion (3) Examination of central problems. May be repeated. Maximum 9 hrs.

575 Topics in Metaphysics and Epistemology (3) May be repeated. Maximum 9 hrs.

577 Philosophy of Mind (3) Relation of mental to physical and of role of words in discourse for mental activities, thinking and feeling. May be repeated. Maximum 9 hrs.

590 Social and Political Philosophy (3) Philosophical problems concerning social and political life: family, state, freedom, justice; major theoretical responses: anarchism, social contract, Marxism. May be repeated. Maximum 9 hrs.

591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

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

620 Topics in the History of Ancient and Medieval European Philosophy (3) May be repeated. Maximum 9 hrs.

622 Topics in the History of Modern Philosophy (3) May be repeated. Maximum 9 hrs.

624 Topics in the History of 20th-Century Philosophy (3) May be repeated. Maximum 9 hrs.

640 Topics in Value Theory (3) May be repeated. Maximum 9 hrs.

646 Topics in Medical Ethics (3) Prereq: Consent of Medical Ethics Committee. May be repeated. Maximum 9 hrs.

675 Topics in Metaphysics and Epistemology (3) May be repeated. Maximum 9 hrs.

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**Physics and Astronomy**

*(College of Liberal Arts)*

**MAJOR**

- Physics
  - M.S., Ph.D.

**DEGREES**

- William M. Bugg, Head

**Professors:**

- Bingham, C. R., Ph.D. ...... Tennessee
- Blase, W. E., Ph.D. ...... Michigan State
- Bock, C., Ph.D. ...... Belfast
- Breazeale, M. A. (On Leave), Ph.D. ...... Michigan State
- Brin, M., Ph.D. ...... Oregon
- Bugg, W. M., Ph.D. ...... Tennessee
- Burgdoerfer, J., Ph.D. ...... Frie Universitat Berlin
- Calcutt, T., Ph.D. ...... Purdue
- Chidler, R. W., Ph.D. ...... Vanderbilt
- Christopher, L. G., Ph.D. ...... Manchester
- Colglazier, E. W., Ph.D. ...... Cal Tech
- Condo, G. T., Ph.D. ...... Illinois
- Crater, H. W. (UTSI), Ph.D. ...... Yale
- Deeds, W. E. (Emeritus), Ph.D. ...... Ohio State
- Duckett, K. E., Ph.D. ...... Tennessee
- Fox, K., Ph.D. ...... Michigan
- Gailer, N. M. (Emeritus), Ph.D. ...... Ohio State
- Georgi, S., Ph.D. ...... Manchester
- Guidry, M. W., Ph.D. ...... Tennessee
- Handler, T. H., Ph.D. ...... Rutgers
- Harris, E. G. (Distinguished Prof.), Ph.D. ...... Tennessee
- Hart, E. L. (Liaison), Ph.D. ...... Cornell
- Jacobson, H., Ph.D. ...... Yale
- King, D. T. (Emeritus), Ph.D. ...... Bristol
- Lewis, J. W. (UTSI), Ph.D. ...... Mississippi
- Macek, J. (Distinguished Scientist), Ph.D. ...... Rensselaer
- Mahan, G. D. (Distinguished Scientist), Ph.D. ...... California
- Mason, A. A. (UTSI), Ph.D. ...... Tennessee
- McGregor, W. K. (UTSI), Ph.D. ...... Tennessee
- Nielsen, A. H. (Emeritus), Ph.D. ...... Michigan
- Obenshain, F. E., Ph.D. ...... Pittsburgh
- Painter, L. R., Ph.D. ...... Tennessee
- Pegg, D. J., Ph.D. ...... New Hampshire
- Plummer, E. W., Ph.D. ...... Cornell
- Quinn, J., Ph.D. ...... Maryland
- Riedinger, L. L., Ph.D. ...... Vanderbilt
- Ritchie, R. H., Ph.D. ...... Tennessee
- Rusk, W. R. (Emeritus), M.S. ...... Tennessee
- Sandner, W., Ph.D. ...... Freiburg
- Sellin, J. A. (Chancellor's Research Scholar), Ph.D. ...... Chicago
- Sih, C., Ph.D. ...... Cornell
- Strayer, M. R., Ph.D. ...... MIT
- Thompson, J. R., Ph.D. ...... Duke
- Thomson, J. O. (Emeritus), Ph.D. ...... Illinois
- Ward, B. F. L., Ph.D. ...... Princeton
- Wheeler, G. W. (Emeritus), Ph.D. ...... Yale
- White, J. W. (Emeritus), Ph.D. ...... North Carolina

**Associate Professors:**

- Barnes, F. E., Ph.D. ...... Caltech
- Elston, S. B., Ph.D. ...... Massachusetts
- Ferrall, T., Ph.D. ...... Clemson
- Muehlhausser, J. W. (UTSI), Ph.D. ...... Tennessee
- Shieh, S. Y., Ph.D. ...... Maryland
- Sorensen, P. S., Ph.D. ...... Copenhagen

**Research Professors:**

- Kamychkov, I., Ph.D. ...... ITEP (Russia)
- Zhang, J., Ph.D. ...... Lanzhou

**Research Associate Professors:**

- Du, Yuan-Cai, Ph.D. ...... Beijing
- McCorkle, D. L., Ph.D. ...... Tennessee

**Research Assistant Professors:**

- Davis, L. (UTSI), Ph.D. ...... Auckland
- Faidas, H., Ph.D. ...... Tennessee
Graduate programs leading to the Master of Science and the Doctor of Philosophy are offered in a number of concentration areas: atomic and low temperature physics, biophysics, chemical physics, elementary particle physics, health physics, heavy ion atomic physics, molecular spectroscopy, nuclear physics, plasma physics, condensed matter physics, theoretical physics, and ultrasonics.

Departmental graduate programs leading to the M.S. and Ph.D. are also available at The University of Tennessee Space Institute, Tullahoma, where opportunities for study and research are available in quantum optics and laser physics, atomic and molecular spectroscopy, fluid physics, and theoretical physics. For additional information, contact the department head.

**ADMISSION REQUIREMENTS**

A student who enrolls in The Graduate School with the intention of attaining an advanced degree in Physics will have completed an undergraduate degree in Physics or its equivalent. Physics 511-12, 321, 431-32, and 461-62 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 DOCTORAL PROGRAM**

All students are expected to take Physics 521-22, 531-32, 541-42, 551, 561, 571-72, and 611. Physics 601-02 are normally required of students specializing in atomic physics; Physics 521-22 of students specializing in elementary particle physics; Physics 626-27 of students in elementary particle physics; Physics 663-64 of students in plasma physics; Physics 661-82 of students in health physics; Physics 671-72 of students in solid state physics; and Physics 681-82 of students specializing in molecular spectroscopy. Students specializing in chemical physics may substitute Chemistry 572 for Physics 551 and should complete at least 6 semester hours chosen from Chemistry 560, 670.

The courses Physics 531-32, 571-72, 521-22, 541-42; 561 constitute the core curriculum. They are the usual basis for the departmental comprehensive examination which is normally taken by a well-prepared student after two years of graduate study.

A reading knowledge of one foreign language in which there exists a significant body of literature is required. For those majoring in Physics 302 with a grade of A or B may be substituted for the corresponding language examination.

The dissertation topic will be chosen with reference to one of the fields in which research facilities can be made available either at The University of Tennessee laboratories in Knoxville; The University of Tennessee Space Institute at Tullahoma, Tennessee; the Oak Ridge National Laboratory, Oak Ridge, Tennessee; or at other research facilities used by the University faculty.

**Astronomy**

**GRADUATE COURSES**

411 Astrophysics (3) Development of analytical physical models of galactic structure of universe, stellar and interstellar matter, and planetary systems. Topical and interdisciplinary, consideration of quasars, pulsars, black holes and current developments in field. Applicable for major credit in physics. Prereq: Physics 232 and consent of instructor.

460 Special Topics in Astronomy (1-3) Topics of current interest in astronomy and astrophysics. Applicable for graduate credit in physics with consent of department. May be repeated with consent of department. Maximum 9 hrs.

**Physics**

**GRADUATE COURSES**

411-12 Introduction to Quantum Mechanics (3,3) Fundamental principles of quantum mechanics and methods of calculation. Solution of Schrodinger equation for simple systems. Application to atomic, molecular, nuclear, and condensed matter physics. Must be taken in sequence. Prereq: 232 or equivalent; Mathematics 345.

421 Modern Optics (4) Transmission of light in uniform, isotropic media; reflection and transmission at interfaces; mathematics of wave motion and interference effects. Rudiments of Fourier optics and holography. Prereq: 431 or Fundamentals of Physics: Wave Motion, Optics, and Modern Physics, or Honors: Mechanics and Heat, and consent of instructor. 3 hrs and 3 labs.


461-62 Modern Physics Laboratory (3,3) 461 - Introduction to fundamental and modern techniques in experimental physics, and to theory and practice of measurement and analysis. Selected experiments in nuclear, atomic, molecular and solid state physics, and modern optics. Prereq: Electronics Laboratory and either Relativity and Structure of the Atom or 411. 462 - Advanced experiments and experimental techniques in modern physics; experimental teamwork. Thorough quantum mechanical interpretation of results and preparation of scientific reports. Prereq: 461. 6 hrs lab per week.

471-72 Health Physics (3,3) Radioactivity, interaction of electromagnetic radiation with matter, radiation quantities and units, point kernel and extended sources, x-rays and gamma rays, neutron activation, interaction of charged particles with matter, stopping power, range-energy relations, counting statistics, shielding, dosimetry, waste disposal, criticality prevention, radiation biology and ecology. Prereq: Consent of instructor.

490 Senior Seminar (1-3) Topic of current interest. May be repeated with consent of department. Maximum 6 hrs.

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

501 Graduate Research Participation (3) Advanced research techniques under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. Maximum 18 hrs. S/NC only. E

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

505 Physics of Fluids (3) Fluid physics, overview of fluid mechanics and associated computational techniques; general description of laminar and turbulent flows; viscous, supercritical and hypersonic flows; continuum, transonic, excited and reactive flows; shock, nozzle flow and sonic orifice expansion flows; reacting and nonequilibrium flows; shock-tube physics; and an introduction to the methods 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 dissector, streak cameras, and fast-framing cameras; high-vacuum systems including cryogenic-based devices, data acquisition techniques including synchronizing, digital electronics methods and micro-computer data acquisition and registration methods.

507 Contemporary Optics (3) Topics in geometrical, physical, Fourier, and nonlinear optics and introductory laser physics. Extensive use of computer calculations and design of practical and sophisticated optical systems.

508 Laser Physics (3) Mode analysis, stable and unstable resonators; rate equations and population inversion, saturation, relaxation oscillations, fluctuations and noise, laser stability; quantum theory of laser, photon coherence; mode-locking, Q-switching and frequency stabilization; specific laser media and applications; laser 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, hydrogenation, angular momentum, electron spin, particles in electric and magnetic fields, perturba-
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, processes, comprehensive plan, implementation issues. Planning issues in society. Not for credit for M.S.P. degree.

446 Housing (3) Nature and demand for housing in U.S. and abroad, U.S. experience, private market processes and public influences. Problems of change in housing supply, affordability, new technology, and environmental programs to improve supply and quality of housing.

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 facility and/or laboratory space. May be repeated. S/N 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 (2) Analysis of nature and objectives of planning process; role of planner and planning function in public decision-making. Prereq: 510 or consent of instructor.

520 Planning Research Methods (3) Research techniques in subject areas associated with city and regional planning. Research tools, data collection and analysis as basis for planning and decision-making.

521 Computers in Planning (3) Basic computer concepts, hardware and software, use of mainframe and microcomputer in planning and government.

523 Statistics for Planners (3) Applications of basic descriptive and inferential classical and non-parametric techniques in planning research. Data organization and display, measures of location, dispersion and association; data transformations; some basic probability theory; selected one and two sample tests; correlation and regression analysis. Prereq: 520 or consent of instructor.


526 Library Research for Planning (1) Survey of publications of interest to planners, resources and research techniques. Use of facilities and collections of local, state, and national libraries. Coreq: 520 or consent of instructor.

530 Planning Analysis and Forecasting (3) Methods of quantitative analysis and modeling in urban and regional studies. 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.

531 Urban and Regional Analysis (3) Past, present and possible future patterns of urban and regional structures drawn on contemporary theories, models, and empirical research.

532 Planning Methods (6) 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 588.)

539 Urban and Site Design (3-6) Principles of design of residential subdivisions and some components of physical community, shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience.

539 Planning for Historic Preservation (3) Planning for preservation, restoration, and conservation of historic buildings, areas and sites as related to comprehensive planning process. National, state, and local government role in preservation, designation of sites, legislative needs, financing and administrative organizations.

540 Legal Aspects of Planning (3) Legal basis for planning and guiding community development. Legal tools of planning. Prereq: 510 or consent of instructor.

545 Planning and Property Development (2) Process of urban physical growth and change; functioning of private sector real estate development and its relationship to planning. Partnership roles of public and private sectors in urban development and redevelopment. Prereq: 510 or consent of instructor.

547 Negotiation (1) Methods, strategies, techniques and skills useful to planners in mediation, negotiation, and dispute resolution concerning urban planning and development.

548 Tourism Planning (3) Planning of tourist resources and programs within a geographic region. Tourism planning models. Relationships among tourists, tourism developments and planning of tourist attractions and services. Application of techniques in selected areas.

549 Fiscal Planning and Capital Improvements (3) Fiscal planning and capital improvements programming in plan implementation. Tax and expenditure limitations, infrastructure financing, municipal bond market, alternative revenue sources: development fees, excise taxes, intergovernmental aid. Evaluation of fiscal policies.


551 State and Regional Planning (3) Theory and practice of planning at state, sub-state, and metropolitan levels.

552 Development Planning in the Third World (3) Seminar on urban and regional development in Third World nations. Population growth, settlement patterns, economic development, land framework of integrated resource management. (Same as Sociology 552.)

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 research and program evaluation, impact assessment.

590 Practicum (3) Prereq: Consent of instructor. S/N or letter grade.

591 Special Topics (1-3) Prereq: Consent of instructor.

592 Readings in Planning (1-3) Prereq: Consent of instructor. May be repeated.

593 Problems in Planning (1-3) Prereq: Consent of instructor.

595 Environmental Assessment and Sustainable Development in Third World Countries (3) (Same as Ecology and Botany 595.)

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
Bell, Frank F. (Emeritus), Ph.D. ............... Iowa State
examination integrating the thesis and coursework.

A student having started on the thesis option is not eligible to transfer to the non-thesis option after the end of the first semester of graduate studies or after having received a Graduate Research Assistantship stipend for more than one semester. A student having started on the non-thesis option may transfer to the thesis option upon approval by a potential major professor and the Department Head.

Non-Thesis Option

A student desiring the non-thesis option should declare this intention at the beginning of the first semester of graduate studies, and must declare it before the beginning of the second semester. In lieu of thesis, students are required to complete 3 hours of 503 for satisfactory participation in a single research program for a period of 12 weeks and the writing of an original, creative and well-written report, both to be conducted by the major professor and approved by the advisory committee. In addition to the research program, a minimum of 30 hours of graduate coursework is required, of which at least 20 must be taken in courses numbered 500 or above. The 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 503. 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 600 and above. 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 fields, direct the research, and recommend the dissertation for approval and acceptance by the Graduate School.

GRADUATE COURSES

411 Soil Microbiology (3) Soil microbial populations and roles in soil processes. Prerequisites: General Microbiology and introduction to inorganic and organic compounds, decomposition of residues, dynamics of soil organic matter. Prereq: Intro to Soil Science or Introduction to Organic 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; describing and interpreting morphology of agricultural and forest soils; chemical and physical properties; classification; mapping. Two Saturday trips. Prereq: 210 or consent of instructor. 2 hrs and 1 lab. Sp

413 Soil Chemistry (3) Principles concerning structure and chemical properties of soil materials; colloidal fraction as related to exchange, chemical equilibria, soil acidity and base saturation, weathering, nutrient availability and waste disposal. Prereq: 311 or consent of instructor. F

414 Soil, Land Use, and the Environment (3) Soil as environmental component and soil properties affecting land use; soil as resource: degradation, nutrient availability, and use. Prereq: 210 or consent of instructor. Sp.A

415 Soil-Water Relations (3) Physical relationships among solid, liquid, and gaseous phases of soil system. Relationships of soil properties to processes governing transport of water, and chemicals in soil. Prereq: Introduction to Soil Science. 2 hrs and 1 lab. 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. Prereq: 290, Botany 231. 2 hrs and 1 lab. F.A

432 Bioclimatology (3) Solar energy budget; interactions among processes on a global, regional, and local scale. Climatic and biological systems: quantification of macro- and microclimates; microclimates and their modification; automatic monitoring station data collection and analysis; biological responses to climatic stresses; climate variation and change and their effects on biological systems. Prereq: 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. Structure, mode of action, degradation and environmental impact of pesticides used in agriculture, forestry and related areas. Prereq: 1 yr biological sciences and 1 semester chemistry. 2 hrs and 1 lab. Sp

434 Postharvest Biology and Technology (3) Principles, methods, and techniques related to maintenance of quality of horticultural commodities. Preharvest handling, harvesting, storage facilities and techniques, quality evaluation and biological and physiological mechanisms related to maturation, ripening, and senescence. Graduate credit requires a short lab project in addition to regular class assignments. Two Saturday field trips. Prereq: 1 yr biological science. 2 hrs and 1 lab.

453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Prereq: Biology 201 or equivalent. 2 hrs and 1 lab. F.A

471 Statistics for Biological Research (3) Application of statistics to interpretation of biological research. Notation, descriptive statistics, probability, distributions, confidence intervals, and chi-square tests, analysis of variance, mean separation procedures, linear regression and correlation. Prereq: Mathematics 121 or equivalent. F

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

501 Seminar Preparation (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to 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 fall semester only. Students may use University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. 1-3 hrs maximum. SINC only. E

503 Seminar (1) Presentations and discussion of current scientific material. May be repeated. Maximum 3 hrs. F.Sp


512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming proc-
**Political Science**

*(College of Liberal Arts)*

**MAJORS**

Political Science ........................................ M.A., Ph.D.

**DEGREES**

**MAJOR**

**UPPER-LEVEL POLITICAL SCIENCE)**

**THE MASTER OF ARTS PROGRAM**

A Bachelor's degree or its equivalent is normally required. Students pursuing the Master of Arts degree may follow one of two options:

**Thesis Option:** (30 hours) Coursework, preparation of a thesis, and an oral examination on coursework and the thesis, is required. At least 12 of these hours must be in political science, with 6 in the field of methodology (Political Science 510 and 512), and 3 hours in the 600-level research seminar in the student's first field of interest.

**Non-Thesis Option:** (36 hours) Coursework, plus a written comprehensive examination on all coursework is required. At least 12 of these hours must be in political science, with 6 in the field of methodology (Political Science 510 and 512), and 3 hours in the 600-level research seminar in the student's first field of interest.

**THE MASTER OF PUBLIC ADMINISTRATION PROGRAM**

The M.P.A. program is intended to prepare students for public service careers by acquainting them with management principles, analytical tools, and the ethical dilemmas they will face as public administrators. It consists of a total of 36 semester hours, including a core program, an elective specialization, and a recommended internship.

Applicants for admission to the program must have a Bachelor's degree or its equivalent. Normally, an overall average of 3.0 and an average of 3.2 in the last two years of political science or social science courses is required. In addition, a composite score of at least 1100 on the verbal and quantitative parts of the GRE is normally required.

The M.P.A. 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: 562 Public Budgeting and Finance; 562 Public Management; 564 Human Resource Management in Public Organizations.
   e. Specialization - 9 hours.

A specialization is designed by the student in consultation with the coordinator of the M.P.A. program. Possible specializations include general government, public health, budgeting and finance, planning, natural resources, program evaluation, criminal justice, public relations, personnel, and others.

2. Recommended internship with a public agency - 6 hours.

Internships are arranged in consultation with the coordinator of the M.P.A. program.

3. 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 Juris 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 enroll coursework or an internship for one semester 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 graduate level courses (500 or 600 level) offered in the Department of Political Science. The M.P.A. program will award a maximum of 9 semester hours of credit toward the M.P.A. degree for successful completion of approved courses offered in the College of Law. All courses for which such cross-credit is awarded must be approved by the J.D.-M.P.A. coordinators in the College of Law and the Department of Political Science. All candidates for the dual degree must successfully complete Administrative Law (Law 821) and are encouraged to take Local Government (Law 824). An Internship is strongly recommended for students in the dual degree program, as it is for all M.P.A. candidates, but an internship is not required.

During the first two years in the dual program, students will spend one academic year completing the required first year of the College of Law curriculum and one academic year taking courses solely in the M.P.A. program. During those first two years, students may not take courses in the opposite area, without the approval of the J.D.-M.P.A. coordinators in both academic units. In the third and fourth years, students are strongly encouraged to take both law and political science courses each semester.

Dual degree students who withdraw from the program before completion of the requirements for both degrees will not receive credit toward either the J.D. or the M.P.A. degree for courses taken in the other program except as such courses qualify for credit without regard to the dual program.

**Awarding of Grades**

For grade recording purposes in the College of Law and the Department of Political Science, grades awarded in courses in the other unit will be converted to either Satisfactory or No Credit and will not be computed in determining a student's GPA or class standing. The College of Law will award a grade of Satisfactory for an approved M.P.A. course in which the student earns a grade of B or higher and a grade of No Credit for any lower grade. The Political Science Department will award a grade of Satisfactory for an approved law course in which the student earns a grade of 2.3 or higher and a grade of No Credit for any lower grade. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

**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.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, all course requirements of each degree program must be reviewed and approved by the respective degree committees that are responsible for overseeing the programs. 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 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 in the 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 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 coursework beyond the Bachelor's degree, must successfully pass written and oral comprehensive examinations in three broad subfields of political science, and must pass a final oral examination on the dissertation.

In addition, students must satisfy a research tool requirement. This requirement may be satisfied either by demonstrating competency in one foreign language, or by completing 12 hours of coursework, numbered 500 or above, in empirical methodology.

In addition to the total hours required for the degree, the following requirements must also be met:

1. At least 63 hours must be in political science courses.
2. At least 48 hours in political science courses must be in courses numbered 500 or above.
3. Completion of Political Science 510 and 512.
4. At least 6 hours must be earned in political science courses numbered above 600, exclusive of dissertation hours.
5. A total of 24 hours must be earned by writing the dissertation.

**GRADUATE COURSES**

430 United States Constitutional Law: Sources of Power and Restraint (3) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political and economic rights.

431 U.S. Constitutional Law: Civil Rights and Liberties (3) Analysis of current issues in civil rights and liberties including: first amendment freedoms, equal protection, privacy and rights of accused.

442 Administrative Law (3) Legal dimensions of administrative power and procedures, and constitutional controls over administrators.

452 Black African Politics (3) Recent evolution and current political environment of Black African nations.

453 Governments and Politics of China and Japan (3) Examination of the political setting, structure and political processes in China and Japan.

455 Latin American Government and Politics II (3) Selected topics on Latin American political dynamics, consideration of leading theoretical explanations. (Same as Latin American Studies 455.)

459 Government and Politics of the Soviet Union (3) Origins and development of Soviet political system, and study of selected policy areas.

461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policies.

463 Contemporary Middle East Politics (3) Governments and movements in Middle East, their characteristics, bases, and interrelationships.

470 International Law (3) Nature and development of international law and compliance. Function of international law in context of international conflict.

475 Ancient and Medieval Political Thought (3) Survey of major western political thinkers from Socrates to Machiaveli to Marx.

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

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

510 Scope and Methods in Political Science (3) Procedures of analysis in political science.

512 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: univariate and bivariate statistics.

513 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: multivariate model building.

514 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration: measurement, analysis, and reporting of data.

520 Political Theory (3) Survey of major ideas, thinkers and works of Western political theory.

522 American Political Thought (3) Systematic examination of the narrative and empirical theories of leading American political thinkers from the colonial period to the present.

530 American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overview of research in various subfields. May be repeated with consent of department. Maximum 9 hrs.

532 Presidency (3) Systematic examination of the structure, functions and powers of the American presidency as they have evolved from the founding to the present.

533 Congress (3) Formal, empirical and theoretical approaches to analysis of the institutional workings of Congress and the behavior of legislators.

535 Mass Political Behavior (3) Theoretical and empirical analyses of public opinion, political socialization, political attitudes and behavior, especially voting behavior.

537 Political Parties and Interest Groups (3) Theoretical and empirical examination of the structure, functions and operations of political parties and interest groups.

539 State and Local Government and Politics (3) Theoretical and empirical analysis of government, politics, policymaking and public administration at the state and local levels.

540 Public Law (3) Selective examination of published research and current approaches in subfields of constitutional law, judicial process, and judicial behavior. May be repeated with consent of department. Maximum 9 hrs.

546 Law and the Administrative Process (3) Constitutional position of government, powers and limitations; procedures and evaluation of questions of structure, role, and administrative choice. May be repeated with consent of department. Maximum 9 hrs.

548 Public Policy Process (3) Theoretical, formal and empirical analysis of policy making in public sector. Management implications of decision making processes of public policymakers, including legislative, executive and judicial actors.

550 Public Administration (3) Overview of public administration and function.

552 Organization Theory (3) Appraisal of major theories of organization and their applicability to public sector.

553 Management of Information Systems (3) Theory, design, development and evaluation of information systems in public organizations. Database systems, computer applications, and training for management information technology.

558 Policy Analysis (3) Strategies and techniques for identification and analysis of public problems and policy solutions. May be repeated with consent of department. Maximum 9 hrs.

558 The Politics of Administration (3) Examination of public administration in context of American political system, policy making and political roles of public administrators and agencies. May be repeated with consent of department. Maximum 9 hrs.

560 Public Budgeting and Finance (3) Technical and political aspects of planning, preparing and adopting government budgets. Management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing risk management, post-auditing.

562 Public Management (3) Interpersonal and leadership skills, techniques and methods for planning, decision making, and implementation of management strategies in public sector. May be repeated with consent of department. Maximum 9 hrs.


566 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system.

569 Internship in Public Administration (3-9) Open to students participating in approved internship programs. May be repeated with consent of department. Maximum 9 hrs. S/N 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 areas studied: Africa, Asia, Latin America, Middle East, 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 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

596 Readings and Special Problems in Political Science (3-15) Prereq: Consent of instructor. May be repeated. Maximum 15 hrs.

600 Doctoral Research and Dissertation (3-15) Prereq: Consent of advisor. May be repeated. Maximum 15 hrs.

610 Special Topics in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science. May be repeated with consent of department. Maximum 9 hrs.

615 Formal Political Analysis (3) Assumptions, methodologies and applications of formal political models, including game theory, rational choice theory, and public choice theory, and mathematical modeling. May be repeated with consent of instructor. Maximum 9 hrs.

628 Topics in Political Theory (3) Selected issues and problems in normative political theory. Specific content determined by instructor. May be repeated with consent of instructor. Maximum 9 hrs.

639 Special Topics in American Government and Politics (3) Advanced study of selected topics. May be repeated with consent of instructor. Maximum 9 hrs.

640 Special Topics in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy. May be repeated with consent of department. Maximum 9 hrs.

642 The Politics of Criminal Justice (3) Selective examination of contemporary problems of research and analysis of criminal justice system; public policy formulation; criminal process; law enforcement administration; criminal court administration; and prison administration. May be repeated with consent of department. Maximum 9 hrs.

654 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. May be repeated with consent of department. Maximum 9 hrs.

660 Contemporary Perspectives on Public Administration (3) Development of theory in public administration; contemporary critiques and alternatives. May be repeated with consent of instructor. Maximum 9 hrs.

667 Comparative Public Administration (3) Comparison of policy-making structures and public policies in selected countries. May be repeated with consent of department. Maximum 9 hrs.
THE MASTER'S PROGRAM

Graduate study leading to the M.A. degree in psychology is available with a concentration in experimental psychology. This program is appropriate for students who desire a Master's degree as part of their progress toward a doctorate or for those who wish to complement a degree in a different field.

Admission

Any student with a B.A. or B.S. may apply to the Department of Psychology for admission to the Master's program. All students must also submit scores from the Graduate Record Examination (general and subject).

Major Advisor and Committee

Initially, the Director of Experimental Psychology will advise the student. As soon as possible, the student must select an advisor and obtain his or her approval for registration. Subsequently, the advisor and student will select two additional faculty members to comprise the student's Master's committee. Final committee approval comes from the Department Dean, upon recommendation by the Department Head.

Program Requirements

All students must complete 30 semester hours of graduate level courses in psychology. These hours must include 504-505, or Statistics 537-538 or an equivalent sequence; 420; six semester hours of Thesis 500; and twelve hours of 500-600-level foundation courses. Students must earn a grade of B or better in all courses that are to count toward the 30-hour total.

THE DOCTORAL PROGRAM

A student with a B.A. or B.S. may apply to the Department of Psychology for admission to the doctoral program with a concentration in general psychology or clinical psychology. The doctoral program with a concentration in ethology or psychology 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 highly flexible and individualized and seeks to provide a professional apprenticeship. Specializations include behavioral medicine and health psychology, child and adolescent development, cognitive and symbolic processes, conditioning and learning, ethnology, theoretical foundations of psychology, 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, or psychology.
2. Competence in general psychology, demonstrated by completing Psychology 513 (Foundations of Psychology) or Psychology 565 (History and Systems of Psychology) or equivalent, plus at least one course or sequence or equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)
   a. Biological psychology: 461-69 Physiology Psychology Laboratory; 526 Neuroanatomy; 527 Behavioral Neurology.
   d. Developmental psychology: 511 Development Psychology; 512 Life-span Development; 571 Child Psychopathology.
   e. Individual differences and personality: 445 Measurement and Testing; 470 Theories of Personality.
3. Research practicum (509) - research apprenticeship involving participation in the ongoing research of two different members of the faculty during the first two semesters in the program.
4. Pre-dissertation research project completed during the second year, involving the collection of original data or original analysis of existing data, reported in publishable form and acceptable to the doctoral supervisory committee.
5. At least 4 graduate seminars in psychology numbered above 600.

Clinical Psychology

This program is designed to lay the groundwork for a career as a clinical psychologist capable of working in both academic and applied settings. The program emphasizes the theoretical foundations of psychology as well as supervised experience oriented toward the development of practical skills. The program embodies the scientist-practitioner model of clinical psychology. Requirements are as follows:

1. Apprenticeship with one faculty member during the first year, one day each week.
2. Pre-dissertation research project completed before forming a doctoral supervisory committee, reported in written form acceptable to the student's faculty advisor and the director of clinical training.
3. Supervised clinical placement two days (16 hours) each week during the second, third, and fourth years.
4. Satisfactory completion of listed courses (or equivalents) in the following nine categories:
   a. Foundations of Psychology (513);
   b. Measurement and Testing (445);
   c. Personality Theory and Research (570-71);
   d. Lifespan Development (512);
   e. Statistics and research methods (504 Empirical Methods in Psychology plus either 505 Research Design or 557 Applied Psychological Measurement);
   f. Psychopathology (572, 573, 574);
   g. Psychological Assessment (594-595, 596);
   h. Psychotherapy (570, 671, 673, 675);
   i. Ethical, Legal, and Professional Issues (635).
5. Satisfactory completion of at least 3 additional graduate-level courses in non-clinical topics in psychology.
6. Satisfactory completion of a one-year clinical internship at a site approved by the program.

MINOR IN GERONTOLOGY

Graduate students in the Department of Psychology may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

GRADUATE COURSES

400 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.
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 studies of nervous system and physiological correlates of behavior. Coreq: 461.

470 Theories of Personality (3) Survey of major theories of human personality and their development. Prereq: 220 and 300 or 330.

480 Theories of Learning (3) Classical and current approaches to learning and cognition. Prereq: 310.

482 Topics in Psychology (3) Intensive analysis of special topics: Afro-American psychology or evaluation of programs in community. Prereq: Biological Basis of Behavior or Behavior and Experience: Humanistic Psychology and at least 9 hrs in 300-level courses. Recommended prerequisite: 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, 499, 691, 492, and 493 combined may apply toward undergraduate major.

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

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


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. Sp

508 Readings and Special Issues in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

509 Research Practicum (1-3) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs. S/NC only. E

510 Topics in Psychology (3) Intensive examination of selected issues in psychology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

511 Developmental Psychology (3) Normal processes of human socialization; physical, cognitive, and emotional development 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. E

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 humans and nonhuman animals; techniques for collecting, transforming, storing, and retrieving data using microcomputers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

526 General Vertebrate Neuroanatomy (3) Lecture and laboratory. Structure and functioning of central and peripheral nervous system. Prereq: 481, 489, or equivalent and consent of instructor. (Same as Zoology 526.)

527 Behavioral Neurology (3) Disorders of nervous system, organic brain dysfunctions. Diagnosis and treatment. Prereq: Consent of instructor.

528 College Teaching in Psychology (3) Concepts, techniques, and materials for teaching psychology at college and/or university level. Supervised practice. Prereq: Consent of instructor. S/NC only.

530 Psychometric Techniques (3) Basic concepts: factor analysis, scaling, test theories, probability models and their applications, computerized adaptive testing and other topics. Prereq: Statistics 537-538 or equivalent. May be repeated. Maximum 6 hrs.


558 Applied Psychological Measurement (3) Issues and techniques in applying psychological measurement in organizational, clinical, and community research. Prereq: Statistics 537-538 or equivalent or consent of instructor. May be repeated. Maximum 6 hrs.

562 Psychology of Learning (1) Theory and research concerning interpersonal interaction and individual behavior in social context. Prereq: Consent of instructor. F

565 History and Systems of Psychology (3) History of philosophy concerning psychology. Major systems of psychology which emerged during 20th century. Prereq: Graduate standing. Sp

570 Personality: Theory and Research I (3) Advanced survey of psychodynamic and neo-Freudian approaches to personality; related research. Prereq: Admission to clinical program or consent of instructor. F

571 Personality: Theory and Research II (3) Advanced survey of behavioral and humanistic approaches to personality. Prereq: Admission to clinical program or consent of instructor. Sp

572 Descriptive Psychopathology (2) Diagnostic criteria of the DSM-III. Examples from written case-history and recorded interviews. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Sp

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. Sp

574 Atypical Development in Childhood (3) Research on etiology of atypical patterns of development in infancy and childhood. Prereq: 511 and consent of instructor. May be repeated. Maximum 6 hrs.

576 Object Relations (3) European and American conceptions of normal and psychopathological development of object relations. Significance for psychotherapy, psychoanalysis, and psychoanalytic theory. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

578 Clinical Aspects of Human Sexuality (3) Variation in human sexual behavior. Theories of etiology, treatment. Prereq: Consent of instructor.


591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

594 Psychological Assessment I (3) Basic concepts and techniques of adult assessment: intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Sp

595 Psychological Assessment II (3) Basic concepts and techniques of adult assessment, intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor. F

596 Laboratory in Psychological Assessment (1) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 4 hrs. S/NC only. Sp

597 Development of Evaluation 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 12 hrs.

605 Seminar in Research and Quantitative Methods (3) Prereq: 505, Statistics 537-538 or equivalent, or consent of instructor. May be repeated. Maximum 12 hrs.

610 Seminar in Applied Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

611 Seminar in Developmental Psychology (3) Prereq: 511 and consent of instructor. May be repeated. Maximum 12 hrs.

613 Seminar in Existential-Phenomenological Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

620 Seminar in Social and Organizational Psychology (3) Prereq: 440 or 560 and consent of instructor. May be repeated. Maximum 12 hrs.

622 Seminar in Comparative and Ethological Psychology (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

623 Seminar in Methods of Naturalistic Research (3) Prereq: 548 or consent of instructor. May be repeated. Maximum 12 hrs.

624 Seminar in Psychometrics (3) Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

625 Seminar in Organizational Psychology (3) (Same as Management 625.)

626 Seminar in Industrial Psychology (3) (Same as Management 626.)

627 Seminar in Applied Industrial Psychology (3) (Same as Management 627.)

635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Educational and Counseling Psychology 635.) Sp

638 Current Topics in Industrial/Organizational Psychology (3) (Same as Management 638.)

661 Advanced Psychometrics (3) Construction and standardization of psychological tests. Test scores; 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. F

671 Psychodynamic Psychotherapy II (3) Theories and principles. Prereq: Admission to doctoral program in clinical psychology and 670 or consent of instructor. Sp
GRADUATE COURSES

411 Modern Religious Philosophies (3) Religious implications of major Western thinkers and movements from Nicolas of Cusa to nineteenth-century German Idealists. (Same as Philosophy 411.)

412 Classical Indian Systems of Philosophy: The Modern Tradition (3) Investigation of selected writings and philosophical problems of traditions of Samkhya, Yoga, Vedanta, Buddhism, or Jainism. Prereq: 374 or 376 or consent of instructor. (Same as Philosophy 412.)

416 Jesus and Paul Compared (3) Central ideas and concepts of each person compared with equivalent concepts in the other. Advanced study of Gospels and Epistles of Paul, involving extensive independent research.

425 Seminar in Western Religions (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

430 Seminar in American Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

435 Seminar in Asian Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

440 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

446 Theoretical Issues in Medical Ethics (3) (Same as Philosophy 446.)

490 Readings and Research in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


531 Topics in Religion and Society (3) Prereq: Consent of instructor.

532 Topics in the History of Religions (3) Prereq: Consent of instructor.

533 Topics in Religious Thought (3) Prereq: Consent of instructor.

556 Topics in U.S. Religious History (3) Research in methods and sources for investigating United States religious history. Prereq: 351, 353, 355, 430, or consent of instructor. May be repeated. Maximum 6 hrs.

591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

Romance and Asian Languages

MAJORS DEGREES

French ............... M.A. ............... Spanish ............... M.A. ............... Modern Foreign Languages ............... Ph.D.

John B. Romeiser, Head

Professors:

Barrett, Paul E., Ph.D. ............... California
Brady, Patrick, D.U.P. ............... Sorbonne
Cobb, Carl W., Ph.D. ............... Tulane

Elliott, Jacqueline C. (Emeritus), M.A. ............... Illinois
Handelsman, Michael H., Ph.D. ............... Florida
Helflin, William H., Ph.D. ............... Florida State
Irving, Thomas B. (Emeritus), Ph.D. ............... Princeton
Maurino, Ferdinando D. (Emeritus), Ph.D. ............... Columbia
Petrovska, Marija (Emeritus), Ph.D. ............... Kentucky
Pinsky, Clara (Emeritus), Ph.D. ............... California
Rivers-Rodas, Oscar (Liaison), Ph.D. ............... California
Romeiser, John B. (Liaison), Ph.D. ............... Vanderbilt
Vazquez-Bigl, A. M. (Emeritus), Ph.D. ............... Minnesota

Wallace, Albert H. (Emeritus), Ph.D. ............... North Carolina
Washburn, Yulan M., Ph.D. ............... North Carolina

Associate Professors:

Campion, Edmund J., Ph.D. ............... Yale
DeRycke, Robert M., Ph.D. ............... Illinois
Diblaria, Salvatore, Ph.D. ............... Wisconsin
DiPuccio, Denise M., Ph.D. ............... Kansas
Dunbar, Cynthia K., Ph.D. ............... Illinois
Levy, Karen D. (Liaison), Ph.D. ............... Kentucky

Assistant Professors:

Beaubois, Margaret, Ph.D. ............... Texas
Briot, Flavia, Ph.D. ............... Washington
Cazenave, Odile, Ph.D. ............... Penn State
Cree, Bryant, Ph.D. ............... California
Da Cruz, Jose, Ph.D. ............... California
Ehrlich, Linda, Ph.D. ............... Hawaii
Holmlund, Christine, Ph.D. ............... Wisconsin
LaCure, Jon, Ph.D. ............... Indiana
Nakuma, Costantino, Ph.D. ............... Sorbonne
Young, Dolly, Ph.D. ............... Texas
THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

Admission Requirements

Applicants must have completed a B.A. in either French, German or Spanish to be accepted into this program. Both graduates of institutions in the United States and those with undergraduate degrees from institutions outside the United States must have a grade point average of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them.

Requirements for the Ph.D.

Candidates must complete a minimum of 63 semester hours of coursework beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. Two tracks are available.

The coursework for Track I must be distributed as follows: (1) at least 39 hours in the first concentration; (2) at least 18 hours in the second concentration; and (3) at least 6 hours in a cognate field.

1. First Concentration: French, German, or Spanish. It consists of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:
   - A maximum of 6 hours of 400-level classes taken for the M.A. may be applied.
   - A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); French 512 (3) or Spanish 512 (3); and French 516 (2) or the appropriate Spanish course.
   - At least 12 hours at the 600 level (exclusive of dissertation hours).
2. Second Concentration: French, German, Italian, Portuguese, Russian, or Spanish (different from the first concentration). It consists of at least 12 hours, with a minimum of 3 hours at the 500 level. Students are encouraged to take classes that complement the primary area of expertise in the first concentration, so that this second concentration will be a useful research tool for the dissertation and future professional activities. (Because Track II students will have taken 12 graduate hours instead of 18 hours in the second concentration, they will normally not be eligible to teach that language at institutions which follow SACS guidelines for college foreign language teaching.)
3. Cognate Field: Six hours must be in courses numbered 400 and above and in a field outside the candidate's first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion of the 6 cognate hours by the language section concerned.
4. Additional requirements for both tracks: A student must demonstrate competence in the languages of both the first and second concentrations by taking a test in each language. The test will include reading, writing, listening, and speaking, and should be completed by the time the student reaches 40 hours of study beyond the bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI).
5. 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.
6. A comprehensive examination on the language and literature of the first and second concentrations must be passed before the student may be admitted to candidacy. The candidate is required to defend his/her dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.
7. 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.
8. 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).
9. For additional courses, see Germanic and Slavic Languages.

ADMISSION REQUIREMENTS

For additional courses, see Germanic and Slavic Languages.

ACADEMIC COMMON MARKET

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

Asian Languages

431 Readings in Chinese Literature (3) Prereq: Mastery of intermediate-to-advanced Chinese or consent of instructor. May be repeated. Maximum 9 hrs.

471 Selected Topics in Asian Studies (3) Content varies. May be repeated. Maximum 9 hrs.

French

GRADUATE COURSES


411 French Literature of the 16th Century (3) Highlights of 16th-century French literature. Excerpts from Rabelais and Montaigne; readings of poems from writers from Lyon and members of Pélàde. Prereq: 212, 218 or equivalent.


413 French Literature of the 18th Century (3) Major works of Enlightenment. Prereq: 212, 218 or equivalent.


416 Survey of Francophone Literature (3) Examination of French literature outside metropolitan France, particularly Africa and Caribbean. Prereq: 212, 218 or equivalent.

420 French Cinema (3) French cinema from earliest days through New Wave directors. Prereq: 212, 218 or equivalent. May apply toward major.


422 Advanced Grammar (3) Improving one's written French by studying basic and more refined structures of French language. Writing creative free-style compositions. Prereq: 342 or 345.

423-24 Advanced Conversation (1,1) Informal conversation with native speaker on contemporary topics. Stresses in-class contact rather than outside preparation. Prereq: 342 or 345. 2 hrs weekly.

425 Introduction to Descriptive Linguistics (3) Phonetics and phonemics, morphology and syntax. Types of languages, linguistic groups, dialects, and dialect geography. Application of descriptive linguistics—field linguistics, dialect study; its practical use in learning languages and in language teaching. Introduction to transformational generative grammar. Prereq: 5hrs of upper-division English or 6 hrs of upper-division courses in a modern or ancient language (exclusive of German and French 301-302, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as Ger-
man 425, Russian 425, Spanish 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, Russian 426, Spanish 426 and Linguistics 426.)

429 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)

430 Theatrical French (2-3) Performance in one or more French plays. Prereq: 212, 216 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, 216 or equivalent.

432 Contemporary French Culture (3) French contemporary civilization and culture since World War II. Problems, cultural works, such as Voyages of Champlain and Journals of Jesus, and literature of contemporary Quebec. Prereq: Intermediate French or equivalent.

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

501 Techniques in Literary Analysis (2) Required for M.A. program. Intensive course in explicatio de textis, 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 applied 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 holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by faculty.

515-16 Bibliography and Methods of Research (2,2) Survey of bibliographical tools and scholarly contributions in French literature and language. Practical exercises on compiling of scholarly data.


531 French Literature of the 16th Century I (3) Literature of the first half of the 16th Century. Rabelais and other prose writers, humanists, and poetry of Marot, Lyonnais group, and young Pléiade poets.

532 French Literature of the 16th Century II (3) Literature of second half of 16th century. Mature works of Pléiade writers and such poets as d'Aubigné and Sponde; Montaigne; writers of scientific works and memoirs; drama.

541 French Literature of the 17th Century 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.)

561-62 Lyric Poetry of the 19th Century (3,3) Reading and interpreting great French romantic poets, "l'art pour l'art" movement, Parnassians, Charles Baudelaire and Symbolists.

571-72 Trends in Modern French Literature (3,3) In-depth study of some of most revolutionary, challenging poets, novelists, dramatists of 20th century.

581-82 The French Novel (3,3) French Novel from 17th through 20th centuries.

583 Problems in Stylistics (3) Survey of comparative English-French stylistics. Development and improvement of one's written French.

584 Literary Criticism: the Foundations of Romance Criticism (3) Survey of critical ideas utilized over centuries and applied to various types of literature.

591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32. Letter grade or S/NC.

594-95 French Directed Readings (3,3) 600 Doctoral Research and Dissertation (3-15) P/NP only. E

621-22-23 Seminar in French Literature (3,3,3) 621--Middle Ages; 622--16th Century; 623--17th Century. May be repeated with consent of department. Maximum 6 hrs each.

631-32-33 Seminar in French Literature (3,3,3) 631-18th Century; 632--19th Century; 633-20th Century. May be repeated with consent of department. Maximum 6 hrs each.

635-36 Survey of Spanish Literature (3,3,3) 435--Spanish literature through Golden Age, 436--Spanish literature since 1700. Prereq: 311, 312.

450 Hispanic Drama (3) Close reading and analysis of representative works by selected dramatists of Spain and Spanish America. Topics vary. May be repeated with consent of department. Maximum 6 hrs.

451 Hispanic Prose (3) Close reading of selected works of prose fiction and essays by major writers from Spain and Spanish America. Topics vary. Prereq: Aspects of Spanish and Spanish American Literature or equivalent. May be repeated with consent of department. Maximum 6 hrs.

452 Hispanic Poetry (3) Major poets of each period. Prereq: Aspects of Spanish and Spanish American Literature or equivalent. May be repeated with consent of department. Maximum 6 hrs.

459 Capstone Colloquium in Spanish (3) Integrative experience. Broad range of issues and topics that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Prereq: 311, 312 or equivalent.

461 Special Topics (3) Aspect of Hispanic literature, culture, linguistics, or foreign language pedagogy. Topics vary. May be repeated with consent of department. Maximum 6 hrs.

471 Latin American Civilization (3) Latin America's diverse heritage and major social and political institutions. 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 methods for teaching and evaluating basic language skills and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.

Spanish

GRADUATE COURSES

421 Phonetics (3) Prereq: 212, or 216 or equivalent.

422 Advanced Grammer (3) Finer points of grammatical structures. Required of all majors. Native speakers must receive consent of instructor. Prereq: 212, 216 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 425, German 425, Russian 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as French 426, Russian 426, and Linguistics 426.)

429 Romance Linguistics (3) (Same as French 429 and Linguistics 429.)

431 Spanish Civilization (3) Major social, political, and cultural achievements of Spanish people from origins of their civilization until today. Prereq: 311, 312 or equivalent.

435-36 Survey of Spanish Literature (3,3,3) 435--Spanish literature through Golden Age, 436--Spanish literature since 1700. Prereq: 311, 312.

450 Hispanic Drama (3) Close reading and analysis of representative works by selected dramatists of Spain and Spanish America. Topics vary. Prereq: Aspects of Spanish and Spanish American Literature or equivalent. May be repeated with consent of department. Maximum 6 hrs.

451 Hispanic Prose (3) Close reading of selected works of prose fiction and essays by major writers from Spain and Spanish America. Topics vary. Prereq: Aspects of Spanish and Spanish American Literature or equivalent. May be repeated with consent of department. Maximum 6 hrs.

452 Hispanic Poetry (3) Major poets of each period. Prereq: Aspects of Spanish and Spanish American Literature or equivalent. May be repeated with consent of department. Maximum 6 hrs.

459 Capstone Colloquium in Spanish (3) Integrative experience. Broad range of issues and topics that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Prereq: 311, 312 or equivalent.

461 Special Topics (3) Aspect of Hispanic literature, culture, linguistics, or foreign language pedagogy. Topics vary. May be repeated with consent of department. Maximum 6 hrs.

471 Latin American Civilization (3) Latin America's diverse heritage and major social and political institutions. 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 methods for teaching and evaluating basic language skills and cultural aspects through seminars, demonstrations, peer teaching, and observation of foreign language classes. Required of all M.A. and Ph.D. students holding Graduate Teaching Assistantships, except those whose previous training or experience warrants their being excused by department.
522 Advanced Communication Skills for Teachers and Other Professionals (3) Advancement of oral and written proficiency in Spanish through extensive use of authentic contemporary materials; class lectures and discussions; oral and written presentations and reports. Especially recommended for graduate students, teachers, and other professionals seeking to maintain or enhance high level communicative competency.

531 Old Spanish (3) Old Spanish language and medieval Spanish literature during 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, picturesque, sentimental, pastoral, and exemplary novels, and dialogues.

534 Don Quixote (3)

535 Golden Age Poetry (3) Garci Lord, San Juan, La Cruz, Lope de Vega, Quevedo, and Gongora.

537 Golden Age Drama (3) Major dramatists of period: Lope de Vega, Tirso de Molina, Ruiz de Alarcon, Guillon de Castro, Calderon de la Barca, Moreto, and Rojas Zorrilla.


542 The Generation of '86 and Ortega (3) Unamuno, A. Machado, Azorin, Valle-Inclan, Benavente, Cerega y Gassett.

543 The 20th-Century Spanish Novel (3) Baroja, Azorin, Valle-Inclan, Perez de Ayala, Cela, Deltis, Goitsoslo, Matute, and at least one present-day novelist.

545 Modern Spanish Poetry (3) From Becquer, Unamuno, A. Machado, Jimenez, Lorca, Guillel, 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)

553 Problems in Linguistics: Romance Languages (3) (Same as French 559.)

554 Thematic Readings (3) (Same as French 559.)


559 Spanish American Prose, 19th and 20th centuries. Theme of Latin American identity.

560 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 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32. Letter grade or S/NC.

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

621 Seminar in Spanish Literature (3,3) Topics vary in field of Peninsular literature. May be repeated with consent of department. Maximum 9 hrs.

631 Seminar in Spanish American Literature (3,3) Topics vary. May be repeated with consent of department. Maximum 9 hrs.


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 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32. Letter grade or S/NC.
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.
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) personal qualifications acceptable for entrance into the professional practice of social work. Students admitted into advanced standing are required to complete a minimum of 42 hours of study in either of the college's concentrations - social work treatment or social welfare administration and planning. Students admitted into advanced standing are required to complete a minimum of 42 hours of study in either of the college's concentrations - social work treatment or social welfare administration and planning. These students must follow the curriculum plan and meet all requirements of the concentration during three semesters of study in the program. Specific information about the advanced standing program is available from the college. Application for admission to the advanced standing program is through the regular admission process.

Extended Study

Planned part-time programs are available in all three branches of the college. Admission requirements are the same as for full-time study. Coursework can be completed over a three- or four-year period. One year of the student's period of study must be on a full-time basis.

Financial Aid

Students may apply directly to the University's Financial Aid Office for assistance such as the National Direct Student Loan or the Work-Study Program. Other stipends are administered by the College and awarded on the basis of financial need. Applications for these funds must be made to the Branch of the College the student will attend. A student must first apply for University assistance, since College funds are considered supplementary to those of the University. Additional information about College stipends may be obtained from the College of Social Work.

General Requirements

1. A minimum of 57 semester credit hours including a) completion of foundation courses and field practice (15 hours) in the course Social Work with Oppressed Populations (3 hours), and c) at least six courses (18 hours) and three semesters of field practice (15 hours) in the social work treatment concentration or at least four courses (12 hours) and three semesters of field practice (15 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 the educational program, the foundation curriculum contributes to the process of professional identification while presenting a comprehensive and broad knowledge base from which to operate in the future as practitioners, supervisors, administrators, and planners.

Upon completion of the foundation curriculum (at the beginning of the second semester), students select a concentration in either social work treatment or social welfare administration and planning.

Social Work Treatment:
The social work treatment concentration provides the educational basis for practice with individuals, families, and groups in order to enhance their social functioning, ameliorate problems, and prevent social dysfunction. The concentration provides knowledge of theory and methodology basic to individual, family, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning:
The administration and planning concentration provides the educational basis for leadership in the design, implementation, and continued delivery of effective human service programs at local, regional, and state levels. This concentration emphasizes theory and skills related to administration and planning, and permits considerable flexibility in tailoring a program to fit the student's individual interests, capabilities, and career goals.

Field Practice

Field instruction is a critical component of the student's first- and second-year programs. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee, the college is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agencies and the field instructors to ensure that students have quality field practice experiences, meeting the objectives of the core curriculum and the concentration.

The college uses a concurrent class and field plan. Students are in field two days per week during the first year and three days per week in the second year.

First-year agency placements are selected to provide practice experiences related to the foundation curriculum content and beginning concentration. Within the placement, each student's experiences are planned and designed according to educational objectives.

Second-year placements are selected according to the student's area of concentration, individual career interests, and educational needs. The student actively participates with the field instruction coordinator and the educational committee in selection of the second-year placement. The second-year field placement experience focuses on the integration of social work knowledge and values, and emphasizes the acquisition and development of practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

Transfer Credits

Coursework equivalent to the first year of the Master's program, completed in another accredited graduate social work program, is usually accepted toward degree requirements. Applicants must meet the admission requirements of The Graduate School and the College of Social Work. Transfer courses must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. An S (earned at the same institution) or the Work-Study Program. 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 a S/C system) or the Work-Study Program is also accepted. In addition, transfer courses must be part of any 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.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.

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 the social, policy, organizational, and community contexts.
- Research-based knowledge to inform and guide social work practice, social policy, and social welfare program development.

The program consists of foundation courses, elective courses, and dissertation research. The courses are available only in Knoxville. Students and their committees can develop a plan for completing their research in Nashville and Memphis based on the availability of dissertation resources.

Admission Requirements

The Ph.D. program is designed for students who have completed a Master's degree in an accredited school of social work and have post-Master's social work/social welfare experience. Applicants who do not meet these requirements, but believe they have equivalent credentials, should contact the Chair of Ph.D. program for further information regarding admissions criteria.

General Requirements

1. A minimum of 60 semester hours beyond the Master's degree including a) completion of 21 credits of required coursework, b) completion of 15 credits of advanced electives, at least 12 of which are taken outside the department, and 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 coursework, electives, and dissertation research. The foundation curriculum consists of 21 hours of coursework in the history and philosophy of social work, issues in direct service and administration and planning, areas of practice, and research methodology and statistics. Upon this foundation, students and their academic committees develop a plan of study consisting of coursework in Social Work and other departments of the University.

Typically, the foundation curriculum is completed and elective coursework 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 completed 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 foundation curriculum. The comprehensive examination is administered by members of the doctoral committee and is designed for the student to demonstrate comprehensive knowledge of the major and cognate areas and the dissertation topic. In case of failure of either examination, the student may request a retake. The result of the second examination is final.

Financial Aid

Financial aid is available to qualified students in the form of fellowships, scholarships, and teaching and research assistantships. Graduate assistantships and other forms of assistance are awarded on the basis of merit and interest to applicants who are accepted into the Ph.D. program.

MINOR IN GERONTOLOGY

Graduate students in the College of Social Work may pursue a specialized minor in gerontology. This interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S.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 Graduate Assistant in the Office of Graduate Admissions and Records.

GRADUATE COURSES

NOTE: Graduate students majoring in fields other than social work are admitted to certain social work courses with the approval of the College of Social Work and the student's major professor.

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

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

508 Practicum in Social Work Research (3-6) Supervised practice in application of research methods to social work. Prereq: 510 and consent of faculty conducting investigation. May be repeated. Maximum 6 hrs. S/NC only. E
509 Graduate Seminar in Public Health (1) Same as Public Health 509, Nutrition 509, Physical Education 509 and Nursing 529.

510 Social Work Research (3) Research methodology applied to problems in social welfare. Problem formulation; research design; ethics; instrument construction; data collection, analysis, and reporting; statistical procedures; research reporting and evaluation of research. Prereq: Admission to college or consent of instructor. F

512 Social Work Practice (3) Basic theory, values, and methodology generic to social work practice at various system levels using 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, developmental, and social variables. Prereq: Admission to college or consent of instructor. F

520 Social Work Practice with Individuals and Families (3) Nature and process of practice with individuals and families in helping them resolve or cope with problems of living. Working with disadvantaged clients and enhancing client competence. Prereq: Foundation or consent of instructor. Sp

521 Social Work Practice with Groups (3) Theories and practice of social work with small groups. Treatment groups, task groups. Prereq: Foundation or consent of instructor. Sp

522 Social Work Treatment with Individuals and Families (3) Nature and process of practice with individuals and families in helping them resolve or cope with problems of living. Working with disadvantaged clients and enhancing client competence. Prereq: Foundation or consent of instructor. F

524 Psychopathology and Social Deviance (3) Theories of and recent research in etiology of psychic dysfunctions and behavior disorders. Sociocultural, psychological, and sociopolitical considerations. Prereq: Foundation or consent of instructor. F

525 Research for Assessment of Social Work Treatment (3) Application of research methods for assessment of social work treatment. Prereq: Foundation, 520 or 522, or consent of instructor. F, Sp

530 Seminar in Social Work Treatment (2-3) Topics in theory and practice of social work treatment with individuals, couples, families, and groups. Prereq: Foundation 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 infant, child, and adult in social and cultural backgrounds. Prereq: Foundation and 520, or consent of instructor.

532 Short-Term Treatment (3) Theory and practice of planned short term treatment, emergency treatment, and crisis intervention. Prereq: Foundation and 520, or consent of instructor.

533 Social Work Treatment with Couples (3) Theories regarding contemporary marriage styles, problem areas in relationships, and application of treatment methods and skills for problem resolution. Prereq: Foundation and 520, or consent of instructor.

534 Social Work Treatment with Children and Adolescents (3) Examination of various treatment modali-
Black, James A., Ph.D. Iowa
Cleland, Donald C., Ph.D. Michigan State
Hastings, Donald W., Ph.D. Massachusetts
Hood, Thomas C., Ph.D. Duke
Ploch, Donald R., Ph.D. North Carolina
Shover, Neal, Ph.D. Illinois
Wallace, Samuel E., Ph.D. Minnesota

Associate Professors:
Benson, Michael L., Ph.D. Illinois
Cable, Sherry, Ph.D. Pennsylvania
Gaventa, John P., Ph.D. Oxford
Kurth, Suzanne B., Ph.D. Illinois
Perrin, Robert G. Liaison)

Assistant Professor:
Jalata, Asafa, Ph.D. SUNY (Binghamton)

The Sociology Department offers graduate study leading to the Master of Arts and the Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option. The graduate program has concentrations in criminology, energy, environment, and resource policy; and political economy. The criminology concentration includes 505, 551, 653, and 655. The energy, environment and resource policy concentration includes 560, 563, 661, 662, 663, and 665. The political economy concentration includes 504, 540, 541, 643, 644, and 645. Both the Master's and the doctoral program allow for the construction of individualized programs of study. Detailed information may be obtained from the Director of Graduate Studies in Sociology. All incoming students will be advised by the Director of Graduate Studies.

ADMISSION REQUIREMENTS

1. Acceptable scores on the general Graduate Record Examination (GRE scores in sociology are requested but not required).
2. Three letters of recommendation (forms may be obtained from the department).
3. Completion of the appropriate previous degree (baccalaureate, preferably with a major in one of the social sciences, for the M.A. program; Master's degree in one of the social sciences for the doctoral program).

THE MASTER'S PROGRAM

Thesis Option

A minimum of 30 hours beyond the baccalaureate degree, including 24 hours of coursework and 6 hours of Thesis 500, is required. Students must complete Sociology 521, 531, Statistics 531, and one foundation course (504, 505, or 560). At or near the end of all coursework, the student must take an oral examination on course material and thesis. The examination will be administered by the student's committee.

Non-Thesis Option

A minimum of 30 hours of coursework is required, including Sociology 521, 531, Statistics 531, and one of the following: 504, 505, or 560. Sociology 534, 622, and Statistics 532 are recommended. Sociology courses at the 400 level may not be taken without the consent of the student's advisor and the Graduate Program Committee. Six hours may be taken in related fields with petitioning the Graduate Program Committee for approval. The student's program may include a minor or cognate field.

Comprehensive Examinations

Written examinations in four areas are required (sociological theory, research methodology, and two substantive areas). Doctoral students are eligible to take the theory and methodology examinations whenever offered. Substantive examinations may be taken upon completion of theory and methodology examinations. Detailed information on examinations and examination options (generalist, specialist, and collaboralst) may be obtained from the department.

Dissertation and Final Examination

A dissertation based on original research must be completed (24 hours). The candidate must pass an oral defense of the dissertation, including the theory and methodology related to the research, in accordance with the deadlines specified by The Graduate School.

MINOR IN GERONTOLOGY

Graduate students in the Department of Sociology may pursue a specialized minor in gerontology. This interdepartmental/interdisciplinary minor gives the student an opportunity for combining the knowledge about aging in American society with his/her major concentration. Please refer to Human Ecology for specific requirements.

ACADEMIC COMMON MARKET

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

GRADUATE COURSES

40S Sociology of Sport (3) Social meaning, organization, and process of sport. Prereq: 291 or consent of instructor. (Same as Physical Education 405.)
414 Sociology of Health Care (3) Organization of health care facilities, staff-patient relationships, demographic characteristics, and prevalence of disease.
415 Sociology of Aging (3) How roles and statuses change with age in relation to major social institutions; impact that rapidly increasing number of older people has on society, effect of society on older people.
446 The Modern World System (3) Critical examination of capitalist world-system as social system, its coherence, boundaries, regions, member groups, cleavages, anatomy 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 environment; conservation and use of appropriate technology. (Same as Urban Studies 464.)
471 Socio linguistics (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. E
504 Sociological Foundations of Political Economy (3) Survey of modern 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 8 hrs.
521 Sociological Theory I (3) Assessment of what sociological theory is; its major figures and their approaches to understanding society.

531 Research Methods in Sociology (3) Research design, measurement, sampling, quantitative and qualitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Underlying assumptions and logical procedures used by sociologists in formulating explanations; foundations of sociological research strategies and techniques.

540 Occupations (3) Occupations in relation to individuals and society, technology, economic stratification, and social organizations.

541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social change in human communities 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 development paths upon selected aspects of social structures and changes.

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, incremental decrement models, and survey techniques of population analysis.

580 Advanced Rural Sociology (3) (Same as Rural Sociology 580.)

585 Seminar in Gerontology (4) Seminar on selected topics in gerontology. Prereq: Consent of instructor. S/NC only.

589 Multicultural Seminar (3) Seminar on selected topics in multicultural education. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

629 Supplementary Readings in Sociological Theory (3) Individual instruction. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

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.

638 Supplementary Readings in Methodology (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of department. S/NC only.

643 Class Analysis (3) Critical analysis of theories and research on class structure and conflict.

644 Political Sociology (3) Critical examination of theories of state and political processes.

645 Advanced Studies in Political Economy (3) Topical seminar. Prereq: 504 or consent of instructor. May be repeated. Maximum 6 hrs.

653 Sociology of Law (3) Intensive examination of selected topics in sociology of law. Prereq: 505 or consent of instructor.

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 urban problems with comparisons to other regions.

665 Advanced Studies in Energy, Environment and Natural Resources Policy (3) Seminar on energy, environmental, and natural resource policy issues. Prereq: Consent of instructor. S/NC only.

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 to student-initiated courses that will not be regularly offered. Prereq: Consent of department. May be repeated. Maximum 6 hrs.


Spanish

See Romance and Asian Languages

Special Programs

(College of Liberal Arts)

James R. Stokely Institute

Lynn Champion, Director

The Stokely Institute curriculum comprises three seminars which are offered once annually during the summer term. The seminars are interdisciplinary in focus and are taught by faculty representing the humanities, the natural sciences, and the social sciences. The content of the three seminars embraces those three major areas of inquiry in the liberal arts, with an emphasis on understanding the characteristic methods and goals of each mode of inquiry and the kind of knowledge each mode yields. Seminar participants are encouraged to think critically and to reflect on the intellectual and practical implications of their learning.

Enrollment in the following courses is restricted to participants in the James R. Stokely Institute Fellows 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

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 the arts and humanities.

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 shaping of scientific thought, and methodology for observation and experimentation in natural sciences.

530 Social Science Perspectives in the Liberal Arts (2) Seminar on nature of inquiry in social sciences. Emphasis on methodology for observation and research in study of human beings, their social environments and their behavior.

Special Services Education

(College of Education)

MAJORS

DEGREES

Special Education ........................................... M.S.
Rehabilitation Counseling ...................................... M.S.
Education ........................................................ Ph.D.

Laurence J. Coleman, Head

Professors:

Benner, Susan M., Ed.D.......................... Columbia
Coleman, Laurence J., Ph.D..................... Kent State
Doll, E. E. (Emeritus), Ph.D.............. Pennsylvania
George, Thomas, Ed.D...................... Tennessee
Hargis, Charles H. (Liaison), Ed.D........ Colorado State
Kronick, Robert F., Ph.D...................... Tennessee
McClam, T., Ph.D......................... Southern Illinois
Miller, James H. (Liaison), Ed.D.......... Auburn
Sandifer, W., Ph.D.......................... Kent State
Woodrick, William E., Ed.D................ Mississippi

Associate Professors:

Cassell, Jack L., Ph.D.......................... Kansas
Colvin, Craig R., Ed.D...................... Virginia
Hannum, Michael C., Ed.D................ Northern Colorado
Greenberg, Katherine H., Ph.D.................. George Peabody
Mulkey, S., Wayne, Ph.D.................... Florida State
Welch, Olga, Ed.D.......................... Tennessee

Assistant Professors:

McLean, J. D., Ph.D....................... Chicago
Warden, K., Ph.D.......................... Tennessee

Instructors:

Ashmore, Don L., M.S......................... Tennessee
Barnes, Wendell W., Jr., M.Ed.............. Georgia
Butterworth, J., Ph.D....................... Vanderbilt
Griffin, M. M. S......................... Vanderbilt
Lacava, C., M.S.......................... Tennessee
Sandefur, R., M.S......................... South Carolina

Lecturer:

Byrd, H. L., Jr., M.S.......................... Tennessee
The Department of Special Services Education offers graduate programs leading to the Master of Science with a major in Special Education or in Rehabilitation Counseling. The department also participates in the Doctor of Philosophy program in Education as described under Education.

THE MASTER'S PROGRAMS

Special Education

The department offers two tracks for the Master's degree in Special Education for all areas of certification. Track 1 is for students who are already licensed to teach in special education or a related field or those who are seeking a Master's degree without teacher licensure. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

An area of concentration may be selected from the following: early childhood special education, general special education, or education of the hearing impaired.

Track 1 students select coursework based on their area of concentration as described below. Some coursework may apply toward State of Tennessee endorsements (add-on certification in specific licensure areas). The non-thesis option requires 36 hours, including a minimum of 18 in special education, and a final written and oral comprehensive examination. The thesis option requires 30 hours including 6 hours of Thesis 500.

Track 2 students select coursework based on a specified course of study required for teacher licensure and options for areas of specialization and/or cognates as described below. The non-thesis option requires 24 hours of internship year coursework and an additional 12 hours prescribed by the student's committee, for a total of 36 hours. The thesis option requires 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 teach 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, physical-health disabled, multiply disabled, and socially or emotionally disturbed.

General special education majors, in conjunction with their committees, select one or more specializations for their program of study. Six to nine hours of coursework in the designated area should be taken. Approved specializations include affective/motivational approaches, assessment/diagnosis, cognitive education, early childhood, gifted education, rehabilitation, and/or technology. Students also may select a cognate of three to six hours of coursework taken outside the department.

Students completing a program of study in the education of the hearing impaired concentration area are qualified to teach in public or residential schools for the hearing impaired. Graduates are eligible for both Council on Education of the Deaf (CED) certification and Tennessee state certification. Internships (student teaching) may be completed at the Tennessee 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 classwork and in internship. The program requires 54 semester hours. Thesis and non-thesis options are available.

ADDITIONAL PROGRAMS

Under the sponsorship of the Office of Special Education and Rehabilitative Services (R.S.A.), specialized institutes for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people are provided. A federally supported Educational Consortium provides staff development and technical assistance for postsecondary programs serving hearing impaired students in a 13-state southeastern region.

Details concerning each program can be obtained by writing to the department head.

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. program in Special Education is available to residents of the states of Kentucky (concentrations in hearing impaired and early childhood only), South Carolina (concentration in hearing impaired only), Virginia (concentration in hearing impaired only), or West Virginia; the M.S. in Rehabilitation Counseling is available to residents of Alabama or 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/C only; Sp,Su

415 Language Development of Hearing Impaired I (3) Language problems of hearing impaired contrasted with scope and sequence of normal language development. Formal linguistic systems used to describe language development problem.


419 Speech Development of Hearing Impaired (4) Theories of speech development, approaches in training perception and production of speech, and aural habilitation. Prac clinic experiences.

421 Field Experience in Modified Programs (3) Practicum 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. S/C only.

423 Communication Processes for the Hearing Impaired (3) Development of sign language. Fingerspelling and educational applications of sign language.

424 Nature of Hearing Impairments (3) Basic principles of audiology: anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interpretation of audiologic services to medical and other rehabilitative disciplines.

425 Introduction to the Psychology and Education of the Hearing Impaired (3) Primarily for those planning to teach hearing impaired. Overview of research related to psychology, social adjustment, communication methodology, language development and education of hearing impaired. Survey of literature. Visits to programs.

430 Psychology and Education of Students with Moderate/Severe Disabilities (6) Nature and characteristics of persons with moderate/severe disabilities and educational strategies appropriate for those populations. Prereq: Special Education Principles and Special Education Strategies, Admission to Teacher Education and Curriculum and Instruction 422. Coreq: 430. S/C only.

433 Observation of Clinical Practice (1) (Same as Audiology and Speech Pathology 433.)

434 Clinical Practice in Speech-Language Pathology I (1-4) (Same as Audiology and Speech Pathology 434.)

440 Voice Disorders (3) (Same as Audiology and Speech Pathology 440.)

454 Education of the Gifted and Talented Children (3) Orientation to psychometric and behavioral studies of giftedness. Analysis of past and present school practices and policies as they relate to curriculum and program implementation. Sp

458 Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; oral language development, understanding of speech and language development; implications for school-age students; integration of oral and written communication skills into cognitive, affective, and social functioning. Opportunities for study of particular exceptionalities. Enrollment limited to special education majors.

470 Psychology of the Exceptional Child (3) Varieties of exceptional children: general characteristics and educational needs; implications of developmental variations for functioning as adults. Opportunity for study of particular exceptionalities. Enrollment limited to special education majors.

471 Internship II: Special Education (3-15) Internship experience designed to allow student to practice art and science of teaching exceptional children under supervision of experienced teachers. Prereq: 480.

473 Audiology II (3) (Same as Audiology and Speech Pathology 473.)

482 Speech and Language Services in the Schools (3) Organization and implementation of speech and language programs in schools. IEP process as it affects assessment, case-selection, and programming for students age 4-21. Procedures and materials, group interaction, and classroom consultation.

483 Clinical Practice in Communication Disorders in Schools (3) Supervised practice with children with communication disorders. Prereq: 433, 434 (80-100 clinical contact hrs.), 482.

484 Internship with Hearing Impaired Children (6) Supervised practicum with preschool, day school and residential students.
posals. Prereq: 9 hrs of research core and consent of instructor.

610 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prereq: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

620 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in theoretically-based research; public school, institutions, agencies or university settings. Prereq: 3 hrs in statistical and research methods. May be repeated. Maximum 9 hrs. S/NC only.

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level field experiences under supervision of practitioner. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

679 Special Topics (1-3) Prereq: Admission to doctoral program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

Speech Communication

(College of Liberal Arts)
Faye D. Julian, 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
Glenn, Robert W., Ph.D. Northwestern

Assistant Professor:
Ambler, R. S., Ph.D. Ohio State
Haas, John W., Ph.D. Kentucky

Graduate courses in Speech Communication provide opportunities for students in a variety of disciplines to investigate how oral language can effect changes in the knowledge, the understanding, the ideas, the attitudes, or the behavior of other human beings.

GRADUATE COURSES
420 Communication and Conflict (3) Communication as significant factor in development, management, and resolution of conflict at interpersonal, small group, organizational or societal levels.
440 Organizational Communication (3) Organizational setting and variaties of communication process that affect quality of human interaction both within and outside organization.
465 Studies in Rhetorical History and Criticism (3) May be repeated. Maximum 6 hrs.
468 Rhetoric of the Woman's Rights Movement to 1930 (3) Historical and critical study of public address in campaign for women's rights in United States from 1830's through 1920's. (Same as Women's Studies 466.)
476 Rhetoric of the Contemporary Feminist Movement (3) Historical and critical study of rhetoric in campaign for women's rights in United States from 1940's to present. (Same as Women's Studies 476.)
480 Ensemble Interpretation (3) Study and presentation of literary texts through group performance.

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. Not used toward degree requirements. May be repeated. S/NC only. E
510 Studies in Persuasion (3) Prereq: 310 or equivalent or consent of instructor.
530 Topics in Group and Interpersonal Communication (3) Prereq: 220, 330, 420, or consent of instructor. May be repeated. Maximum 6 hrs.
550 Studies in Rhetoric (3) Content varies. Prereq: 460 or consent of instructor. May be repeated with consent of department. Maximum 9 hrs.
570 Legal and Ethical Issues of Communication (3) Communication rights and responsibilities. Prereq: Consent of instructor.
590 Directed Reading and Research (3) May be repeated. Maximum 6 hrs.
591 Foreign Study (1-15) See page 32.
592 Off-Campus Study (1-15) See page 32.
593 Independent Study (1-15) See page 32.

Statistics

(College of Business Administration and Intercollegiate Program)

MAJORS DEGREES
Statistics ............................................. M.S.
Business Administration ........................ MBA

Professors:
Downing, Darryl J. (Adjunct), Ph.D. Florida
McLean, Robert A. (Emeritus), Ph.D. Purdue
Parr, William C., Ph.D. Southern Methodist
Phlipot, John W., Ph.D. VPI
Sanders, Richard D., Ph.D. Texas
Sanders, William L. (Adjunct), Ph.D. Tennessee
Sylwester, David L., Ph.D. Stanford
Thigpen, Charles C. (Emeritus), Ph.D. VPI

Associate Professors:
Bozdogan, Hamparsum, Ph.D. Illinois
Guess, Frank M., Ph.D. Florida State
Leitnaker, Mary G. (Liaison), Ph.D. Kentucky
Leon, Ramon V., Ph.D. Florida State
Moe, Robert W., Ph.D. Iowa State
McGuire, Stephen S. (Adjunct), Ph.D. Kansas State
Raney, Gipsie B. (Adjunct), Ph.D. NC State
Walker, Esteban, Ph.D. VPI
Wright, Tommy (Adjunct), Ph.D. Ohio State
Younger, M. S., Ph.D. VPI

Assistant Professor:
Lin, Dennis K. J., Ph.D. Wisconsin

Lecturer:
Schmidhammer, James L., Ph.D. Pittsburgh

Instructors:
Neidert, Sharon, M.S. Miami (Ohio)
Cwiek, Charles, M.S. Tennessee
Wright, S. Paul, M.S. Tennessee

Additional Intercollegiate Program Committee Members:
Bunting, Dewey, Liberal Arts
Dessart, Don, Education
Fribourg, Henry, Plant and Soil Science
Glison, Charles, Social Work
Huck, Schuyler W., Educational Counseling Psychology
Ladd, R. T., Management
McClaren, 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 12. Applicants for Statistics must submit results of the Graduate Record Examination (GRE) general portion, although CMAT exam scores may be substituted. Applicants for the statistics program must have completed at least two years of college-level mathematics, including the calculus of several variables and matrix algebra, and be proficient in a computer language. Applicants whose native language is other than English must submit results of the Test of English as a Foreign Language (TOEFL).

Curriculum
A minimum of 33 credit hours must be completed for the Master's degree. Required of all students are 6 hours in statistical methods, 6 hours in statistical theory, 1 hour in statistical
computing, and 3 hours in either supervised consulting or internship. Students must complete a minimum of 21 hours in approved statistics courses, exclusive of consulting, internship, independent study, or thesis.

**Thesis or Independent Study**

The thesis option for the Master’s degree requires the student to complete 6 hours for the thesis. Alternatively, the non-thesis option requires a minimum of 3 hours for an independent study project.

**Comprehensive Examination**

Students must pass a two-part written comprehensive examination covering 1) theory and 2) methods. Upon failure of 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 degree's program. The program enables a student to obtain the M.S. in Statistics simultaneously with the Ph.D. or Ed.D. in another department. The program also enables a student to obtain a Statistics minor along with the M.S., Ph.D., or Ed.D. in another department. The program is administered by an executive committee with advisory input from the program faculty. The program is open to well-qualified graduate students in all departments which have an approved Statistics minor or joint major curriculum offered through the program.

Curriculum requirements for the statistics component of each joint degree are specified in terms of completion of alternative sequences of course options. Course options consist of courses in statistics, offered either by the Department of Statistics or by other departments, that have been reviewed and approved by the Executive Committee. Interested students should contact their major department head for information on specific course requirements.

**General Admission Requirements**

1. The student’s sponsoring department must have established with the executive committee an approved joint degree program along with specified sequences of statistics courses taught by the Statistics Department and/or other departments.

2. The student’s Admission to Candidacy form must contain the requirement for Statistics minor/major set off in a group and labeled “Statistics courses required for the minor/major.”

3. In many cases, a student may not decide to apply for participation in the program until he/she has completed two or three statistics courses. In that case the student’s major professor should file a program change with the cooperating departments and assist the student in obtaining a Statistics Department faculty member to serve on the student’s committee.

**Degree Requirements**

The program offers the M.S. in Statistics with a minor in another department, a joint major program in which the student earns a Master’s or doctoral degree in the student’s sponsoring department along with the M.S. in Statistics, and a joint major and minor program in which the student earns a Master’s or doctoral degree in the student’s sponsoring department along with a minor in Statistics. The table below presents the minimum number of semester hours in statistics for each of these alternatives. The hours do not represent the minimum required for the degree program. The student selects courses to satisfy the requirements established by the student’s sponsoring department and approved by the Program Executive Committee.

The student’s committee must include a faculty member of the Statistics Department at the rank of Assistant Professor or above. The student’s formal examination procedure as established by the sponsoring department must include an appropriate section on statistics. Successful completion of the Statistics minor/major is recognized by appropriate documentation on the student’s transcript. Students who do not complete all requirements for the Statistics major/minor will still receive academic credit for statistics courses they have successfully completed.

**Degree Program:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S. in Statistics, minor outside of Statistics</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>M.S. outside of Statistics, minor in Statistics</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>M.S. outside of Statistics, usual separate requirements for both degrees</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Approved Statistics courses from the Department of Statistics and/or other departments</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

**BUSINESS ADMINISTRATION CONCENTRATION**

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

**MBA Concentration:**

Statistics

Minimum course requirements are 571, 566, 572 with prereq or coreq of 561.

**ACADEMIC STANDARDS**

A graduate student in the College of Business Administration whose grade-point average falls below 3.0 will be placed on probation. A student on probation will be dropped from the program unless his/her cumulative 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 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.

461 Applied Regression Analysis (3) Linear regression and correlation, multiple regression, polynomial regression, selection of variables, use of dummy variables, analysis of residuals, logistic regression and its applications. Use of standard computer packages. Major writing requirements: Prereq: Probability and Statistics for Scientists and Engineers II and Introduction to Statistical Software or graduate standing and consent of instructor.

462 Analysis of Variance and Experimental Design (3) Analysis of variance techniques for simple and multiple factor models, past hoc procedures. Design considerations for completely randomized, hierarchical and split-plot experiments, balanced and unbalanced designs, response surface methodology. Major writing requirements. Prereq: Probability and Statistics for Scientists and Engineers II and Introduction to Statistical Software or graduate standing and consent of instructor.


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

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

531 Survey of Statistical Methods I (3) Univariate and bivariate data collection and organization, statistical estimation and hypothesis testing, analysis of relationships for categorical and numerical data, including Chi-square tests and simple linear and quadratic regression. Use of computing facilities required. Credit not given for both 531 and 537. Prereq: 1 yr. college mathematics. E

532 Survey of Statistical Methods II (3) Multiple linear regression, including use of dummy variables, single and multiple factor analysis of variance and covariance; issues in experimental design and analysis. Use of computing facilities required. Prereq: 531. E

537 Statistics for Research I (3) Principles and application of statistical methodology, integrated with considerable use of major statistical computing system. Probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation. Credit not given for both 531 and 537. Prereq: 1 yr undergraduate mathematics and 1 undergraduate statistics course. Sp

538 Statistics for Research II (3) General linear model as applied to multiple regression and analysis of variance. Diagnostic and influence techniques. One-way, factorial, and nested designs, preplanned versus post-hoc contrasts. Random factors and repeated measures. Prereq: 537 or 532. F

561 Introduction to Computing for Data Management and Analysis (1) UTK computing environment for beginning statistics graduate students. Use of operating system commands, system editor, utility programs and SAS statistical package for data entry and editing, file management and statistical analysis. Use of UTCC computing facilities required. Coreq: 531, 537 or 571, or consent of instructor.


564 Theory of Statistical Inference (3) Introductory theory covering 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; randomized experiments, completely randomized designs, analysis of covariance, split-plot and nested designs, fractional factorials, sequential designs. Prereq: 571.

585 Principles of Statistical Process Management (3) Control charts and other statistical techniques applied to management of business processes. Prereq: Consent of department head.

587 Graduate Seminar (1-6) 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 only.


593 Independent Study (2-6) Faculty directed readings and investigation of specified topic in probability or statistics. Written report and oral presentation. Prereq: 2 courses in statistics and consent of the statistics department director of graduate studies. May be repeated. Maximum 6 hrs. S/N only.

596 Statistical Consulting Practicum (1-6) Supervised experience helping on-campus researchers plan, manage data, and develop and perform analyses specific to designs and hypotheses. Discussion of activities in regular seminar meetings. Final written reports and detailed diaries. Prereq: 572 or 538. May be repeated. Maximum 6 hrs. S/N or letter grade.

671 Applied Multivariate Methods (3) Aspects of multivariate analysis, tests of significance with multivariate data, multivariate analysis of variance, multivariate regression, principal component analysis, factor analysis discriminant analysis and classification. Prereq: Matrix-based regression and analysis of variance, experience using SAS or SPSS.

673 Linear Models (3) Review of full rank models and models not of full rank with application to unbalanced designs, generalized inverses, estimable functions, b.i.u.e., linear hypothesis testing, reductions in sums of squares, least squares means, mixed model equations, methods of variance component estimation from unbalanced data. Prereq: Analysis of variance.

675 Categorical Data Analysis (3) Log-linear analysis of multidimensional contingency tables. Logistic regression. Theory, applications, and use of statistical software. Prereq: 1 yr graduate-level statistics, regression analysis and analysis of variance and familiarity with CMS or VAX; or consent of instructor.

681 Special Topics in Probability (1-3) Presentation of specialized topics in probability and stochastic processes. May be repeated. Maximum 6 hrs.

683 Special Topics in Statistics (1-3) Presentation of specialized topics in statistics. May be repeated. Maximum 6 hrs.

Gregory C. Petty, Interim Head

Professors:
Cameron, W. A., Ph.D. Ohio State
Campbell, C. P., Ed.D. Ohio State
Cheek, Gerald D., Ph.D. Kansas State
Cookey, Carol B. (Liaison), Ph.D. Wisconsin
Craig, D. G., Ed.D. Cornell
Haskell, R. W., Ph.D. Purdue
Matthews, John I., Ph.D. Arizona State
Peters, John M., Ed.D. New Mexico State
Reed, J. L. (Emeritus), M.S. Oklahoma State

Associate Professors:
Brewer, Ernest, Ed.D. Tennessee
Brockett, Ralph, Ph.D. Syracuse
Hanson, R., Ph.D. Purdue
Kasworm, Carol, Ed.D. Georgia
Ledford, B. J., Ed.D. Tennessee
Mann, E. C., Ed.D. Penn State
Petty, G. C., Ph.D. Missouri
Radcift, B. J., M.S. West Virginia

THE MASTER'S PROGRAM

The Department of Technological and Adult Education offers graduate programs leading to the Master of Science with a major in Technological and Adult Education. Two tracks are available. Track 1 is for students who are already certified to teach or those who are seeking a Master's degree without certification. Track 2 is for students seeking initial licensure. Thesis and non-thesis options are available for both tracks.

Track 1 - Concentrations are available in adult education, business and marketing education, educational leadership, instructional technology, and technology education. The non-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.

Track 2 - Concentrations are available in business and marketing education, instructional technology, and technology education. The non-thesis requirements are Education 574 and 591, 6 hours; for business and marketing education, 531 and 532, 6 hours; for technology education, 553 and 556, 6 hours; internship, 12 hours; and 12 hours of specialty courses as approved by the student's committee for a total of 36 hours. The thesis option requires 6 additional hours of thesis 500 for a total of 42 hours.

THE SPECIALIST PROGRAM

The Ed.S. program is a cooperative undertaking involving all vocational service areas. Concentrations are available in agricultural, business, marketing and distribution, home economics, industrial, and technical education, and in general 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, 21 hours; cognitive field, 9 hours; professional education core, 9 hours; research techniques, 12 hours; and dissertation, 24 hours. A minimum of 80 hours above the baccalaureate is required.

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

ACADEMIC COMMON MARKET

An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UT Knoxville on an in-state tuition basis. The M.S. and Ed.D. programs in Technological and Adult Education are available to residents of the state of South Carolina; the Ed.D. program is available to residents of Kentucky and West Virginia. Additional information may be obtained from the Resident 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 Marketing Education (3) Teaching techniques, aids and evaluation in subject matter fields. Prereq: Consent of instructor. F,Su

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, operations, and management as affects instructional 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 effectiveness of training through development of performance-based measures. Evaluation of incumbent worker job performance. Prereq: Senior standing or consent of instructor. Sp,Su

456 Organization and Operation of VIGA/HOSA (3) Planning, organizing and implementing youth-club activities in vocational-technical programs. Prereq: Senior standing or consent of instructor. Sp,Su

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any
531 Organization and Supervision of VOE and Marketing Education Programs and Marketing Development, improvements in occupations, guidelines in cooperative laboratory, and model office programs. Trends in office and marketing education, physical facilities, state plans, instructor qualifications and advisory committees. Prereq: Consent of instructor. F, Su

532 Improvement of Instruction in Basic Business and Marketing Education (3) Issues, research findings, methods, and materials for improved instruction of both secondary and post-secondary levels. Prereq: 12 hrs of graduate credit. Sp, Su

533 Improvement of Instruction in Office Technology (3) Research, principles of learning issues, and materials in typewriting, wordprocessing, business communications, and office procedures. Prereq: Consent of instructor.

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 Education (3) Curriculum design in career, secondary, post-secondary and ongoing education, philosophy, structure and functions of post-secondary education, fundamental principles and contemporary objectives. Prereq: Consent of instructor. F

536 Organizing and Teaching Adult Business and Marketing Education (3) Planning, organizing, promoting, teaching and evaluation continuing education programs in business and marketing education; utilizing trade associations, employment agencies, business groups, and advisory committees in program implementation. Prereq: 3 yrs teaching experience and consent of instructor. F, Su

537 Measurement in Business and Marketing Education (3) Testing and evaluation of learner performance in business and marketing education; teacher-made tests. Prereq: Consent of instructor. Sp, Su

540 Special Topics in Business and Marketing Education (1-3) Specific objectives, activities and evaluations vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

541 Practicum in Business/Marketing Education (3) Practical updating and upgrading experiences in non-traditional settings for business and marketing teachers. Prereq: 15 hrs of graduate credit. E

542 Problems in Business and Marketing Education (3) Selective research problems in teaching of business and marketing education and related areas. Prereq: Consent of instructor. F

550 Administration of Industrial Education Programs (3) Development, student evaluation 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 programs. Staff development, curriculum improvement and program updating techniques. Prereq: 455 or equivalent. F, Su

552 History and Philosophy of Industrial Education (3) Socio-political factors that impact development of industrial education. Historical problems: justification, values, principles and concepts of industrial education. Prereq: Consent of instructor. F

553 Planning Technical Education Facilities (3) Preparation of educational specifications, site selection, and working relationships with other professionals involved in process of planning technical education facilities. Prereq: Consent of instructor. Sp, Su

554 Technical Program Planning (3) Instructional systems and methods: learning, design, development, implementation, and evaluation of trade, technical supervision and related training. Prereq: Curriculum development course and consent of instructor. F, Su

555 Curriculum Planning for Industrial Education Programs (3) Development of performance-based, cross-referenced instructional programs. Prereq: 374 or 554 or consent of instructor. Sp, Su

556 Staff Development Programs (3) Strategies for improving programs, 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) Proper selection and effective application of innovative methods and teaching specialized skills and technical information. Diversifying and individualizing teaching of technical subjects. Prereq: 373. Sp, Su

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, S

559 Evaluation of Technical Training Programs (3) Internal and external evaluation of training programs to maintain quality control and/or 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, measurement procedures for quality control, Prereq: Statistics course and consent of instructor. F, Su

572 Advanced Training Methods for Industrial Productivity (3) Techniques for involving 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)须P/NF only.

601 Curriculum Planning in Technological and Adult Education (3) Curriculum theory, models, contents, planning evaluation and implementation of specialized program areas. Prereq: 355 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.

605 Administration and Supervision of Technological and Adult Education (3) Leadership, policy, organization, planning, development services, and budgeting relating to vocational, technical and adult education at secondary, post-secondary, and higher education levels. Prereq: Permission and management activities. Prereq: Administrative theory course and consent of instructor. F, Su

610 Research Development in Technological and Adult Education (3) Proposal development, theoretical base, research design, sampling, application of statistics, and evaluation of research in technological and adult education. Prereq: 6 hrs of advanced statistics courses and consent of instructor. Sp, Su

611 Internship in Technological and Adult Education (3) May be repeated. Maximum 9 hrs. P/NF only.

612 Special Topics in Technological and Adult Education (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

615 Advanced Microcomputer Software Applications (3) Advanced programming and applications of intelligent or program-generating software. Progression of commercial relational data management programming environments. Conceptualizing and individualizing communications and networking. Hands-on environment. Prereq: 516 or equivalent. Sp, Su


620 Seminar in Adult Education (3) Issues in adult education, theories and concepts, philosophical posi-
Textiles, Retailing and Interior Design

(College of Human Ecology)

MAJORS

DEGREES

Interior Design ......................................... M.S.
Textiles, Retailing and Consumer Sciences M.S.
Human Ecology ........................................ Ph.D.

Nancy B. Fair, Head

Professors:

Blakemore, R. G. (Emeritus), Ph.D. Florida State
DeLong, A. J. (Liaison), Ph.D............. Penn State
DeJonge, Jacquelyn O., Ph.D............ Iowa State
Druke, Mary Fran, Ph.D.................. Penn State
Duckett, Kermit E., Ph.D. .......... Tennessee
Wadsow, Larry C., Ph.D. .............. NC State

Associate Professors:

Bresee, Randall R. (Liaison), Ph.D. Florida State
Canestaro, Nancy, Ph.D. ............ Michigan
Dyer, C. L., Ph.D. ...................... North Carolina
Fair, Nancy B., Ph.D. ............... NC State
Rabun, Josette, Ph.D. .......... Tennessee

Assistant Professors:

Bhat, Gajanan, Ph.D. ................ Georgia Tech
Dillard, Susan, Ph.D. .......... Florida State
Gupta, Millend, Ph.D. .......... Missouri
Houser, T. L., M.S. .............. Tennessee
Lee, Jin-Kook, Ph.D. ........ Ohio State

Research Assistant Professors:

Dever, Molly, Ph.D. ............ Kansas State
Huang, Xuan Chao, Ph.D. .......... Leeds
Ko, Wen-Chien, Ph.D. .......... Tennessee
Malkan, Sanju, Ph.D. ........ Tennessee
Tsai, Peter, Ph.D. .............. Tennessee

Instructor:

Weiss, Kurt, M.S. ............... Tennessee

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. An interdepartmental/interdisciplinary minor in gerontology gives the graduate student an opportunity for combining the knowledge and experience about aging in American society with his/her own major concentration.

621 Advanced Seminar in Program Planning (3)
Concepts, principles, and theories related to program planning in adult education. Prereq: 521 or equivalent. Sp.

622 Advanced Seminar in Adult Development (3)

626 Advanced Problem Solving and Learning (3)

630 Current Issues in Business and Marketing Education (3)

631 Higher Education in Business and Marketing Education (3)

The Master's program in Interior Design will provide a balance between creative and theoretical foundations of the field; emphasis is placed on the dissemination of knowledge. The program is accredited by the Foundation for Interior Design Education Research (FIDER). The goal of the graduate program in interior design is to provide the student with scholarly and professional experiences through seminars, studio work, and research. Interdisciplinary thrusts will increase the depth of understanding of the field of interior design essential to function as educators or as independent professionals.

Areas of emphasis within interior design may include: historic preservation and adaptive use/history of interior design, computer-aided design, and human environment interaction. Supporting courses are available in lighting, furniture design, business, etc.

The programs in Textiles, Retailing and Consumer Sciences prepare students for careers in industry, business, public and private agencies, and educational institutions. Master's level work enables students to conduct research in retail management and merchandising and in the consumer related areas to retail decision making. Students in textile science are expected to have a solid foundation in mathematics, as well as a formal background in a physical science or engineering.

Interested students should contact the department head for more information.

ADMISSION REQUIREMENTS

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

In addition to specified entrance requirements stipulated by The Graduate School, admission to the particular programs in the department is based on the following requirements:

Interior Design

Admission to the Master's degree program with a major in Interior Design requires: 1) a background in interior design, 2) a cumulative GPA of 3.0 or above (on a 4.0 scale), and 3) a portfolio of undergraduate studio work (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.

Textiles, Retailing and Consumer Sciences

Admission to the Master's degree program with a major in Textiles, Retailing and Consumer Sciences is dependent on completion of undergraduate courses that give the necessary background for success in the graduate program. For the concentration in Retail and Consumer Science, students should have an adequate background in retailing and/or consumer science supported by coursework in economics, marketing, mathematics, and statistics. For the concentration in textile science, students should have a basic technical background in textile science or materials science supported by mathematics through differential equations, organic chemistry, and general physics.

Superior students deficient in one or more of the above requirements, may be admitted at the discretion of the department's graduate faculty.

THE MASTER'S PROGRAMS

Interior Design

The M.S. in Interior Design requires the completion of 36 hours of graduate credit. The requirements for the degree include the following: in the major (510, 552, 564, and 590), 18 hours: a cognate area, 6 hours; research methods (RCS 562), 3 hours; and statistics, 3 hours; a comprehensive design project with acceptable documentation, a publishable paper with outside review, or a thesis, 6 hours.

Based on interest and prior background, each student has a choice of the area(s) of emphasis within the field of interior design beyond the core curriculum. Emphasis may include professional interior design, historic preservation, history of interior design, environment and behavior, or computer-aided design.

Each student is required to demonstrate competence in individual research in one of the following ways:

Thesis Option: Complete a thesis for 6 hours credit. An oral examination will occur upon completion of the program.

Non-Thesis Option: Complete a comprehensive design project with acceptable documentation or a publishable paper. To be eligible, the student must have completed 12 hours of graduate credit in interior design with at least a 3.0 GPA. Having met this criteria, the student must present a proposal to the supervisory committee that will include 6 hours of subsequent coursework. This proposal must outline the nature of the project and/or paper and explain the methodological approach. A comprehensive oral and written examination, administered by the committee, will occur upon the completion of the program.

Textiles, Retailing and Consumer Sciences

The major in Textiles, Retailing and Consumer Sciences has concentrations in Retail and Consumer Sciences and in Textile Science. Requirements are listed below.

A comprehensive oral examination, administered by the thesis committee, will be given upon completion of the thesis research. A non-thesis option is not available.

Retail and Consumer Sciences

Major (Required courses: 510, 511, 550, 562, 590) 19 hours
Cognate Area 6 hours
Statistics 3 hours
Thesis 6 hours
TOTAL 34 hours

Textile Science

RCS 552 3 hours
Research Methods 3 hours
TS 550 1 hour
Textile Science courses 12 hours
Cognate Area 6 hours
Statistics 3 hours
THE PH.D. CONCENTRATIONS

Consumer Environments

Students enrolled in the Ph.D. program with a concentration in consumer environments are provided with a foundation in management and retail and consumer sciences or in understanding the consumer in the designed environment and management of facilities. From this base, students focus on retail and consumer sciences or on areas of specialization including historic preservation and adaptive use, human environment interaction and facilities management to further their theory and application in advanced study and research. See the consumer environments concentration under Human Ecology.

Textile Science

Students enrolled in the Ph.D. program in Human Ecology with a concentration in textile sciences 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; Sixteen hours in textile science courses;
6. Nine hours in a cognate area;
7. 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 in Textiles, Retailing 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

400 Proxemics (3) Space and behavior within cultural context. Application to design and design process. Theoretical foundations of U.S. design concepts from environment and behavior. Simulation techniques and methods for identifying behavioral design requirements. Prereq: Human Ecology.

450 Advanced Interior Design II (5) Comprehensive studio projects of advanced complexity. Integration and extension of experiences utilizing systematic design methodologies. Prereq: Advanced Interior Design or consent of instructor. F


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

502 Registration for Use of Facilities (3-15) Required when student uses University facilities and/or faculty time before degree is completed. May be used toward degree requirements. May be repeated. Maximum 6 hrs. Prereq: Admission to graduate program. F

520 Integrative Interior Design Studio (3) Identification, integration and synthesis of multidisciplinary data input. Advanced programming techniques and design evaluation. Lecture and studio. Prereq: 510, 564, or consent of instructor. Sp

531 Research Methods in Historic Preservation (3) Methodology for historic preservation problems in interior design. Prereq: Architecture 403 or consent of instructor. Sp

555 Micro-computer Research Applications in Interior Design (3) Use of 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.

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, physiolog, anthropology 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.

575 Environment and Aging (3) Seminar on design of physical environment and relationship to aging process. Concepts and theories from design, and social and behavioral sciences. Prereq: 6 hrs social/behavioral science or consent of instructor.

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 Interior 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.

590 Research Seminar (1-2) S/NC only. E

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

610 Issues in Interior Design (1) Readings, reports, and discussion concerning current research and related issues in interior design: history of interior design, historic preservation, environment and behavior. Registration each semester of residence.

620 Advanced Special Topics in Interior Design (3) Selected topics of major interest: history of interior design, advances in historic preservation, environment and behavior. Topics vary. Prereq: 510, 552, 564, 565. May be repeated. Maximum 9 hrs.

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.

Retail and Consumer Sciences

GRADUATE COURSES

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 9 hrs.


540 Socio-Psychological Aspects of Apparel (3) Apparel and human behavior in social situations. Prereq: 6 hrs or equivalent from sociology and psychology.

550 Consumer Economics and Market Choices (3) Economic framework for analyzing consumer behavior and consumer choice within market system. Theory of consumer preferences and decision making; consumption analysis and models for individuals and households. International consumer economics, issues and policies. Prereq: Textile and Apparel Economics, Mathematics 503R or equivalent. F,A

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; microeconomics, F.A.


590 Research Seminar (1) Research topics in retail and consumer sciences. May be repeated. S/N only. F.Sp.

593 Directed Study (1-3) Individual problems in retailing and consumer sciences. Prereq: 9 hrs retailing and consumer sciences graduate coursework. May be repeated. Maximum 9 hrs. Su.

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


615 Retail and Consumer Sciences Literature and Thought (3) Evaluation of retail and consumer sciences literature with emphasis upon research literature, development of scholarly thought, and identification of potential areas of further study. Prereq: 562, Marketing 501, Economics 501, F.A.

616 Research Methods, Models and Measurement in Retail and Consumer Sciences (3) Quantitative methods and analytical concepts in research process. Mathematical and statistical formulation of retail and consumer sciences phenomena, utilizing models, model building and measurement constructs. Prereq: 562, Marketing 501, Economics 501, F.A.

617 The Consumer and Public Policy (3) Public policy issues within consumer environments. Analysis of past and present policies within economic, social, legal and business frameworks. Implications of consumer issues and policy alternatives. Literature and research focus. Prereq: 550 or consent of instructor.

651 The Consumer and Public Policy (3) Public policy issues within consumer environments. Analysis of past and present policies within economic, social, legal and business frameworks. Implications of consumer issues and policy alternatives. Literature and research focus. Prereq: 550 or consent of instructor.

655 Advanced Topics in Retail and Consumer Sciences (3) Lecture, group discussion on specialized topics. Prereq: 9 hrs retailing and consumer sciences graduate coursework or consent of instructor. May be repeated. Maximum 9 hrs.

680 Research Seminar (1) Research topics in textile science. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

Textile Science

GRADUATE COURSES

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

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

510 Fiber Science (3) Physical properties, mechanical properties and microstructure of polymeric fibers; relation to end-use properties. Prereq: Organic Chemistry and Thermal Physics or equivalent.

520 Optical Microscopy (4) Basic compound and polarizing microscopy for imaging. Optical property measurements, and structure elucidation. Other methods of optical microscopy. Prereq: Fundamentals of Physics, Wave Motion, Optics and Modern Physics or equivalent. 3 hrs and 2 labs.

521 Nonwoven Science and Technology I (3) Nonwoven fabric technology; different web forming processes; and relationships among the chemical, morphological and mechanical properties of fibers and orientation in webs to final performance properties of bonded structures. Prereq: Organic chemistry or consent of instructor.

524 Advanced Textile Dyeing and Finishing (4) Chemistry, processing and fastness of chemical finishes and processes of classes of dyes on different fibers. Prereq: 510 or consent of instructor. 2 hrs and 4 labs. Sp.

525 Physical Properties and Processing of Textiles (3) Methods and mechanics of processing staple and continuous filament yarns; mechanics of deformation of fibers, yarns and fabrics; physical behavior and textile structure. Prereq: Mechanics of Materials or equivalent.

526 Nonwovens Science and Technology II (3) Interrelations between mechanics of production and mechanical properties of nonwoven fabrics; characterization of fiber morphology and web structure; chemistry of nonwoven binders and finishes; and engineering of specific fabric properties. Prereq: 521 or equivalent.

590 Research Seminar (1) Research topics in textile science. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

593 Directed Study (1-3) Individual problems in textile science. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

595 Advanced Topics in Textile Science (3) Lecture, group discussion on specialized topics. Prereq: 9 hrs textiles graduate coursework or consent of instructor. May be repeated. Maximum 9 hrs.

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

625 Physical Chemistry of Fibers (3) Physical chemistry of fibers and fiber forming polymers; surface chemistry and thermal properties. Prereq: 510.

655 Advanced Topics in Textile Science (3) Lecture, group discussion on advanced topics and research areas of current significance: future directions, professional issues, theoretical approaches. Prereq: Doctoral student and 9 hrs textiles graduate coursework. May be repeated. Maximum 9 hrs.

Theatre

(Majors in Liberal Arts)

MAJOR

Theatre

DEGREE

M.F.A.

Tom Cooke, Head

Professors:

Cooke, Tom, Ph.D. ........................................ Florida State
Colohan, R. M. ................................................. Colby
Custer, M., M.F.A ................................................. Wisconsin
Field, R. C., M.A ................................................. Miami (Ohio)
Garvie, Peter, M.A. ................................................. Cambridge
Harris, Al J., Ed.D. ................................................. Tennessee
Mashburn, Robert R., Ph.D. ............................... Florida State
Soper, Paul L. (Emeritus), Ph.D. ........................ Cornell

Associate Professor:

Black, W., M.F.A. ................................................. Illinois

Assistant Professors:

DeQuin, L. J. (Lialson), M.F.A. .......................... Tulane
Gould, B. K., M.F.A. ................................................. Catholic
Moran, J., M.F.A. ................................................. Brandeis
Oliva, J. L., Ph.D. ................................................. Northwestern
Weber, T., M.F.A. ................................................. Arizona

Adjunct Faculty:

Arnaout, P., M.A. ................................................. Catholic

The Department of Theatre offers the Master of Fine Arts degree in Theatre with area concentrations in acting, directing, playwriting, dramaturgy, scene design, costume design, lighting design and theatre technology. Not all areas of concentration accept applicants every year.

Applicants must have completed undergraduate degrees approximately equivalent in requirements to those specified for degrees conferred by The University of Tennessee, Knoxville.

The Graduate Record Examination, three letters of recommendation and interviews with appropriate faculty are required of all applicants. Applicants for admission to M.F.A. design/ technical theatre and playwriting/dramaturgy programs must submit samples of their work. Auditions are required of M.F.A. degree acting and directing applicants.

For detailed information about the graduate program, contact the Director of Graduate Studies, Department of Theatre.

THE MASTER OF FINE ARTS PROGRAM

At least 60 semester hours, 40 of which must be at the 500 level or above, are required for the degree of Master of Fine Arts with a major in Theatre, which is normally to be completed in three consecutive years of full time residence. Theatre 501 is required the first year of residence. Proficiency in theatre history, as demonstrated by examination in the department, is required in addition to 5 hours of dramatic literature and criticism and/or advanced theatre history.

Students in the M.F.A degree program are evaluated annually by juried performance or portfolio submission. Continuation in the program is with the approval of the faculty committee for the M.F.A degree program. Satisfactory completion of the comprehensive examination is prerequisite to entry into the third year. Theatre 599 Projects in Lieu of Thesis and an oral defense of the project must be completed satisfactorily before the degree is conferred.

In addition to the core requirements listed above, each area of concentration has specific requirements:
hours of 585 Production Workshops, 430 Play Directing, 3 hours of 536 Projects in Directing, and 12 hours of 573 Seminar and Projects. In addition, students must select an arts and humanities specialization comprising at least one year of language study plus 6 hours in the selected area.

**REQUIREMENTS FOR SECOND MASTER’S DEGREE**

Students admitted to the MFA program who have already earned a Master’s or a doctoral degree may apply up to 12 credit hours from the previous graduate program to the MFA degree with approval of the student’s committee, the Dean of the College of Liberal Arts, and the Dean of The Graduate School.

Any such credits applied from a previous graduate program would be from courses that are directly relevant to the student’s MFA curriculum and must have been earned within the time limit (6 years) established for completion of the MFA degree.

**ACADEMIC COMMON MARKET**

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

**GRADUATE COURSES**

401 Principles of Theatrical Design (3) Fundamental principles of design; visual and structural relationships. Projects assigned to develop understanding and perception.

409 Stage Make-up (2) Problems in make-up design and application, character analysis, physiognomy and chiroscuro. Prereq: 100.

410 Dramatic Theory and Criticism (3) Theatre aesthetics from Aristotle to present.

420 Special Studies in Acting (3) Consent varies. Exercises in selected areas such as styles, techniques, approaches, e.g., Shakespeare, movement, humor. Prereq: Advanced Acting and consent of instructor. May be repeated. Maximum 9 hrs.

426 Applied Phonetics (2) Development of skills in transcription and reproduction of principal varieties of English Language in North America and Great Britain and selected foreign dialects in North America. Prereq: Consent of instructor.


445 Advanced Costume Construction (3) Advanced studies in construction techniques, tailoring, vacuum forming, plastic molding, and cobbling. Prereq: 345 or consent of instructor.

446 Costume Pattern Making (3) Draping patterns for period costumes. Consery and study of historic patterns 1500-1600. Prereq: 345 or consent of instructor.

450 Advanced Scenery Technology I (3) Study and practice of stage rigging for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

451 Advanced Scenery Technology II (3) Study and practice of metaworking and plastics for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

452 Advanced Scenery Technology III (3) Study and practice of stage rigging for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

454 Scenery Painting (2) Introduction to materials, techniques, and principles of craft. Gaining skill and understanding through studio experience. Prereq: Consent of instructor.


456 Rendering (3) Techniques in monochrome and full color illustration of space and form. Prereq: Acquaintance with basic mechanical perspective and freehand sketching.


462 Advanced Lighting Design (3) Advanced problems in lighting design and theory, lighting musical theatre, opera, and dance. Prereq: 362 or consent of instructor.

463 Sound Design (3) Sound design for performing arts. Review of equipment and acoustical factors that affect sound production. Sound design plotted from selected plays. Final projects mixed, edited, and cued for production.

465 Aesthetics of Lighting Design (3) Theory and practice of stage lighting design, relationship between designers and non-practitioners: directors, actors, choreographers, architects, etc.

470-71 Playwriting (3,3) Advanced instruction in writing selected plays. May be repeated. Maximum 9 hrs.

502 Registration for Use of Facilities (3-15) Required in addition to credits applied from a previous MFA degree and consent of advisor. May be repeated. Maximum 9 hrs.

510 Studies in Theatre History (3) Intensive study of selected topics in theatre history. May be repeated. Maximum 9 hrs.

520-21-22-23-24-25 Master Classes in Acting (4,4,4,4,4,4) Master classes in acting techniques, voice, and movement. Theatre MFA students only.

536 Projects in Play Directing (3) Practical work in play direction involving various lengths and kinds of scripts. May be repeated. Maximum 9 hrs.

542 The Social History of Costume (3) Study and analysis of costume as related to society’s manners and mores, architecture and furniture.


545 Painting and Dyeing for the Theatre (2) Fibers, dyes and dye processes; color matching and distressing techniques and processes of scenic design. Development of skills. Prereq: 355 and consent of instructor.

549 Projects in Costume Technology (1-3) Individualized studies in costume technology in theatrical production. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


553 Projects in Scenic Design (1-3) Conception and completion of major projects, both hypothetical and actual, in scenic design. May be repeated. Maximum 9 hrs.

554 Studies in Scenic Design (3) Advanced scenic design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 6 hrs.

555 Advanced Scenery Painting (2) Advanced instruction in materials, techniques and principles of scene painting; studio experience in dimensional simulation, faux-finishing and carved detail. Prereq: 454 or consent on instructor.

560 Projects in Lighting Design (1-3) Conception and completion of major projects, both theoretical and actual, in lighting design. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

562 Special Problems in Lighting Design (3) Advanced problems in lighting design and theory, problems in Broadway production and touring. Prereq: 462 or consent of instructor.

563 Projects in Sound Design (1-6) Production assignment as sound designer on approved play and/or relevant projects in field of sound design/history/methodology. Prereq: 463 or approval of instructor. May be repeated. Maximum 9 hrs.

570 Dramaturgy: Theory and Practice (3) Methods and materials. Prereq: Consent of instructor.

572 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 design and technical production. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

584 Production Workshops (1-6) Directed experience in production collaborations. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


599 Project in Lieu of Thesis (1-6) Available to theatre MFA students only. Prereq: Minimum of 30 hrs toward MFA degree and consent of advisor. May be repeated. Maximum 9 hrs.

**Transportation**

See Marketing, Logistics and Transportation

**Urban Practice**

(College of Veterinary Medicine)

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<th>MAJOR</th>
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<td>D.V.M.</td>
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<td>D. J. Krahwinke, Head</td>
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<td>Professors:</td>
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<tr>
<td>Brace, J., D.V.M.</td>
<td>California (Davis)</td>
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<tr>
<td>Bright, R. M., D.V.M.</td>
<td>Ohio State</td>
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<td>Dorn, A. S., D.V.M.</td>
<td>Illinois</td>
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<td>Krahwinke, D. J., D.V.M.</td>
<td>Auburn</td>
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<td>Legende, A. M., D.V.M.</td>
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<td>Associate Professors:</td>
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<tr>
<td>Bright, J., D.V.M.</td>
<td>Purdue</td>
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<tr>
<td>Daniel, G. B., D.V.M.</td>
<td>Auburn</td>
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Veterinary Medicine

(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine
Comparative and
Experimental Medicine

D.V.M. 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. Pre-veterinary course requirements 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** 3
General Biology 4
Genetics 3
Cellular Biology*** 3

TOTAL 56

*May include, for example, courses in English 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 37996-0300.

Applications must be completed and mailed in time to reach the UT Knoxville Director of Admissions by January 15 each year. All supporting documents, original 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 rotation experience extending over one calendar year.

The first year consists mostly of the pre-clinical subjects of anatomy, physiology, histology, and microbiology. Also included in this first year are clinical subjects of physical diagnosis and anesthesia. Considerable integration of subject matter is incorporated during this year.

The second and third years include the study of diseases, their causes, diagnosis, treatment and prevention, and courses are team-taught on an organ system basis.

The final year (three semesters) is devoted to intensive education in solving animal disease problems, involving extensive clinical experience in the Veterinary Teaching Hospital. Each student will rotate through a series of clinical blocks.

An innovative feature of this curriculum is the designation of semester six as one in which the individual student may select his or her courses of study. This allows select students who have 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 enrolled in the D.V.M. program are required to complete at least 16 credit hours in the sixth semester and may register for up to 10 credit hours of graduate courses without enrolling in The Graduate School and these hours will be credited toward the D.V.M. degree. This semester of elective study offers a unique educational alternative for select students in the CVM and is intended to enhance professional growth, concentration in an area of interest and career opportunities.

In addition to education in the science and art of veterinary medicine, students receive instruction in paramedical subjects such as animal behavior, medical communication, professional ethics, jurisprudence, economics, and practice management.

The curriculum requires successful completion of 154 semester credits.

THE GRADUATE PROGRAM

The College also administers a graduate program involving all departments which leads to the Master of Science and the Doctor of Philosophy. 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
provides graduates for teaching and/or research careers in the health sciences.

ACADEMIC COMMON MARKET

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

PROFESSIONAL COURSES

811-12 Microbiology II, (5,4) Pathogenesis of bacterial, viral and fungal diseases. Study relating microbial structure, metabolism and genetics to patterns of disease and mode of action of antimicrobials, antigens and antibodies. Immunobiology, study of mechanisms of immune reaction, diagnostic immunology, and role of immune response.

817 Special Problems in Microbiology (1-8) Extra mural and specially designed study for students interested in select topics in bacteriology, mycology, virology and immunology.

821-22 Anatomy II, (4,4, Gross and applied anatomy: neural structures of common domestic animals, dog, cat, horse, cow, sheep, goat, bird, reptile, fish, and those of common zoo animals. Sectional anatomy, fetal development, microscopic anatomy, and stereotaxic surgery.

823-24 Physiology II, (4,4) Introduction to concepts and problems in physiology which form basis for clinical applications and for formal training in pharmacology, medicine, pathology, and surgery. Cellular, nervous, cardiovascular, renal, respiratory, digestive, endocrine, and reproductive physiology.


827 Special Problems in Animal Science (1-8) Extra mural and specially designed study for students interested in select topics in bacteriology, mycology, virology and immunology.

830 Art of Veterinary Medicine I (1) Paramedical subjects important to veterinary medicine: practice management, interpersonal relationships, communication, jurisprudence, ethics, careers, animal behavior and veterinary history. May be repeated. S/NC only.

831 Physical Diagnosis (1) Basic care, feeding, restraint, and handling of 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 the veterinarian in public health. 

834 Hematopoietic System (3) Pathophysiology, special pathology, and clinical management of diseases of the hematopoietic and lymphoid organs and tissue. 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 Integumentary System (3) Pathophysiology, special pathology, medicine and surgery of diseases of integumentary system. Laboratory examination, pathology, diagnosis and treatment.

841 Reproductive System (4) Pathophysiology, special pathology, medicine and surgery of diseases of male and female reproductive systems and mammary glands.

842 Laboratory Medicine (5) Pathophysiology, special medicine and surgery of diseases of alimentary systems.

843 Musculoskeletal Systems I (3) Pathophysiology, special pathophysiology, medicine and surgery of diseases of muscular and skeletal systems. Basic principles, pathologic changes and radiographic interpretation.

844 Musculoskeletal Systems II (3) 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) Pathologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases; recent scientific advances in biomedical sciences.

846 Multispecies Medicine (4) Anatomy, pathophysiology, medicine and surgery of avian species, laboratory and zoo animals and reptiles. Species and diseases seen by pre-veterinarian. Current topics on foreign animal diseases.

847 Current Topics in Veterinary Medicine (1-3) Elective subjects in veterinary medicine: basic sciences, clinical specialties and issues related to veterinary practice.

848 Art of Veterinary Medicine II (1) Paramedical subjects important to veterinary practice: practice management, interpersonal relations, communication, jurisprudence, ethics, careers, animal behavior and veterinary history. May be repeated. S/NC only.

850 Introduction to Clinics (1) Clinical veterinary practice with discussions and practical experience. Problem solving and application 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, special pathophysiology, medicine and surgery of diseases of cardiovascular system. Anatomic, physiologic and pharmacologic principles which provide basis for treatment.


854 Respiratory System (3) Pathophysiology, special pathology, medicine and surgery of diseases of respiratory system. Upper and lower respiratory system: infections and noninfectious diseases.

856 Radiology (3) Basic, advanced and special techniques in radiology with interpretation and use of radiologic and related techniques in diagnosis and treatment of animal diseases.

857 Special Senses (2) Pathophysiology, special pathology, medicine and surgery of diseases of visual and auditory systems.

858 Nervous System (3) Pathophysiology, special pathology, medicine and surgery of diseases of nervous system: clinical neurology and neuropathology.

860 Clinical Rotation in Specialties (2) Clinical training in specialty services: anesthesiology, ophthalmology or dermatology. Direct responsibility for diagnosis, patient care, and treatment of clinical patients.

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 avian medicine, laboratory animal and zoo animal medicine, epidemiology, public health, and other related disciplines.

867 Special Problems in Environmental Practice (1-8) Extra mural and specially designed study for students interested in select topics in avian medicine, laboratory animal medicine, zoo animal medicine, epidemiology, public health, pharmacology or toxicology.

871 General Pathology (4) Principles of pathology: causes of disease, disturbances of cell growth, inflammation and neoplasia.

873 Parasitology (3) Principles of parasitology: protozoology, helminthology, and entomology and relationships to diseases in animals.

875 Clinical Rotations in Pathobiology (2) Clinical training and demonstrations in laboratory diagnosis; post-mortem examination and clinical pathologic, parasitologic and microbiologic techniques.

876 Clinical Rotations in Pathology II (1) Clinical training and demonstrations in laboratory diagnosis: post-mortem examination and clinical pathologic, parasitologic and microbiologic techniques.

877 Special Problems in Pathobiology (1-8) Extra mural and specially designed study for students interested in select topics in morphologic pathology, clinical pathobiology, microbiology and parasitology.

881 Clinical Rotations in Urban Practice I (4) Clinical training, medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, care, and treatment of clinical patients.

882 Clinical Rotations in Urban Practice II (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, care, and treatment of clinical patients.

883 Clinical Rotations in Urban Practice III (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, care, and treatment of clinical patients.

884 Clinical Rotations in Urban Practice IV (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, care, and treatment of clinical patients.

885 Clinical Rotation in Radiology I (2) Clinical training in radiographic techniques and interpretation of radiographs as part of diagnostic process.

887 Special Problems in Urban Practice I (8) Extra mural and specially designed study for students interested in select topics in medicine, surgery, anesthesiology, radiology and medical specialties of small (companion) animals.

891 Clinical Rotations in Rural Practice (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

892 Clinical Rotations in Rural Practice II (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

893 Clinical Rotations in Rural Practice III (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

894 Clinical Rotations in Rural Practice IV (4) Clinical training in medicine, surgery, specialty disciplines and herd health of food animals and horses. Direct responsibility for diagnosis, care and treatment of clinical patients.

895 Clinic Rotation in Radiology II (2) Clinical training in radiographic techniques and interpretation of radiographs as part of diagnostic process.

897 Special Problems in Rural Practice I (8) Extra mural and specially designed study for students interested in select topics in medicine, surgery, reproduction, radiology and medical specialties of large animals.
**Graduate Courses**


536 Toxicology (2) Principles of toxicology, molecular mechanisms, toxicologic processes and clinical features of animal diseases caused by common toxic agents. Prereq: Consent of instructor. F

537 Multispecies Medicine (4) Anatomy, pathopharmacology, medicine and surgery of birds, reptiles and laboratory and zoo mammals. Common species and diseases. Prereq: Consent of Instructor. Sp

545 Principles of Medical Science (2) Physiologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases; recent scientific advances in biomedical sciences. Prereq: Consent of instructor. Sp

550 Principles of Zoology (4) Principles of zoology, evolution and classification of animal groups. Prereq: Consent of instructor. F

**Zoology**

(College of 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

Carson, J. G. (Emeritus) (Distinguished Prof.), Ph.D........ Pennsylvania

Chen, T. T., Ph.D................. Florida

Echternacht, Arthur C., Ph.D....... Kansas

Etier, 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............ Oxford (UK)

Kennedy, J. R., Ph.D............. Iowa

Lies, J. N. (Emeritus), Ph.D........ Ohio State

MacCabe, J. A. (Liaison), Ph.D........ California (Davis)

McCracken, G. F., Ph.D............. Cornell

Pimm, S. L., Ph.D............. New Mexico State

Riechert, Susan E., Ph.D........... Wisconsin

Roth, L. Evans, Ph.D.............. Chicago

Shivers, C. A., Ph.D............. Michigan State

Vaughan, G. A., Ph.D............. Duke

Wacht, H. G. (Emeritus), Ph.D........ Florida

Whitson, G. L., Ph.D............. Iowa

**Associate Professors:**

Burnham, K. D. (Emeritus), Ph.D........ Iowa

Drake, J. A., Ph.D.............. Purdue

Fox, David J., Ph.D........ Johns Hopkins

Ganguly, R., Ph.D............. Nebraska

Greenberg, Neil, Ph.D........ Rutgers

McKeel, B. D., Ph.D............. Michigan State

Pan, M. L., Ph.D........ Pennsylvania

**Research Associate Professor:**

Tindall, R., Ph.D........ Penn State

**Assistant Professors:**

Boake, C. R. B., Ph.D........ Cornell

Gittleman, J. L., Ph.D........ Sussex

Hall, J. C., Ph.D........ Illinois

The Department of Zoology offers the Master of Science and Doctor of Philosophy with concentrations in aquatic biology, ecology, cell and molecular biology, physiology, genetics, and reproductive and developmental biology.

**Requirements for Admission**

Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are:

1. an year of general zoology or biology;
2. 18 semester hours of upper division zoology (biology); and
3. two years of chemistry including one year of general inorganic chemistry;
4. one year of mathematics including calculus;
5. one year of physics;
6. Graduate Record Examination scores (general and biology); and
7. a grade-point average of 3.0 out of 4.0.

Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the department's Graduate Affairs Committee.

**The Master's Program**

Special requirements in Zoology are as follows:

1. a completion of course requirements as determined by the candidate's faculty committee, including a course in biostatistics; (2) achievement of a 3.0 or better GPA in all courses taken for graduate credit; (3) completion of a thesis.

**The Doctoral Program**

Special requirements in Zoology are as follows:

1. courses as determined by the candidate's faculty committee, including a course in biostatistics;
2. an oral and comprehensive written examination in zoology and allied fields in which the candidate has had training;
3. a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning a grade of at least a B in the second semester of a special language reading course for graduate students. This foreign language requirement must be fulfilled before a student can take the comprehensive examination.

**Graduate Courses**

403 General Genetics Laboratory (2) Experiments designed to illustrate basic principles of inheritance; primary organism--Drosophila. Prereq: Biology 220. 2 labs.

405-06-11-12 Minicourse in Zoology (2,2,2,2) Select advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 4 hrs may apply toward zoology major.

420 Cell and Tissue Structure and Function (4) Study of animal cells and tissues at light and electron microscopic levels. Prereq: Biology 210. 2 hrs and 2 labs.

430 Immunology (3) (Same as Microbiology 430.)

439 Immunology Laboratory (2) (Same as Microbiology 439.)


449 Laboratory in Physiology (2) Prereq or coreq: 440 or 445.

450 Comparative Animal Behavior (3) Principles and methods of ethology; ecological, developmental, physiological and evolutionary aspects. (Same as Psychology 450.)

459 Comparative Animal Behavior Laboratory (3) Introduction to observational and experimental research in ethology. Coreq: 450. (Same as Psychology 459.)

460 Evolution (3) Modern concepts of animal evolution. Prereq: Biology 220.

465 Human Genetics (3) Genetic and molecular principles and problems of human inheritance. Prereq: Biology 220.

470 Aquatic Ecology (3) Introduction to physicochemical nature of inland waters with description of biotic communities and their interrelationships. Prereq: Chemistry 120-30 and Biology 230. 2 hrs and 1 lab.

472 Arachnology (3) Biology of spiders, scorpions and relatives. Prereq: 360 or 380. 2 hrs and 1 lab.

473 Herpetology (3) Biology of amphibians and reptiles, ecology and adaptive radiation. Prereq: Biology 230. 2 hrs and 1 lab.

474 Ichthyology (4) Evolution, classification, collection and identification, distribution and biology of fishes, freshwater fauna of Eastern North American. Prereq: Biology 230 or consent of instructor. 2 hrs and 2 labs.

475 Ornithology (3) Behavior, ecology, populations, evolution and field identification of birds. Prereq: Biology 230. 2 hrs and 1 lab.

476 Mammalogy (3) Evolution, classification, biogeography, ecology, behavior and functional anatomy of mammals. Prereq: Biology 230 or equivalent. 2 hrs and 1 lab.

480 Physiology of Exercise (3) (Same as Physical Education 480.)

490 Comparative Endocrinology (3) Comparative analysis of physiology and morphology of endocrine glands in vertebrates and invertebrates, their role and interaction in maintenance of organism and species. Prereq: 440 or equivalent.

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

501 Graduate Research Participation (Advanced research techniques studied under supervision of staff research director. Open to all graduate students in good standing. Prereq: Consent of department and research director. S/N only.

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

503 Zoology Seminar (1) Advanced topics in zoology. Senior zoology majors encouraged. Requires completion of all first- and second-year graduate courses. May be repeated. Maximum 4 hrs. S/N only.

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

506 Research Methods (1-3) Instruction in methods and techniques of research. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 9 hrs.

507 Animal Cell Culture (2) Techniques for culture of animal cells, tissues and organs. 1 hr and 1 lab.
510 Introduction to Electron Microscopy - Transmission Electron Microscopy (4) Practical application of techniques for preparation of biological samples for viewing in transmission electron microscopy. Use of microscope and ancillary equipment, darkroom techniques, preparation of materials for publication and special project. Admission limited only to departmentally approved graduate students. (Same as Botany 510.) 2-3 hr labs. Sp

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

513 Advanced Developmental Biology (3) Molecular and genetic aspects of differentiation and morphogenesis; current literature. Recommended prereq: Life Sciences 511-12.

516 Colloquium in Ethology (1) (Same as Psychology 516.)

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 organizational 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. Terrestrial vertebrates. Prereq: Undergraduate courses in animal physiology and ecology, 440 and Biology 230 or equivalent.

525 Physiological Ethology (3) Behavioral endocrinology and neurology from ethological perspective; reciprocal relationships of physiology and behavior in natural context. Term paper, review of assigned topic, creative development of special aspect. Prereq: 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.)

560 Biometry (3) Statistical methods in analysis of quantitative biological data. Prereq: Statistics course or consent of instructor.

573 Population Biology (3) Genetics and ecology of natural populations of plants and animals and aspects of behavior in determining population structure. Prereq: Introductory courses in ecology and genetics. (Same as Botany 573 and Ecology 573.)

575 Ecological Genetics (3) Genetics of natural populations, using both single-locus and quantitative genetic approaches. Prereq: 573 and statistics course.

583 Zoogeography (3) Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course or consent of instructor.

591 Foreign Study (1-15) See page 32.

592 Off-Campus Study (1-15) See page 32.

593 Independent Study (1-15) See page 32.

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

601 Advanced Topics (1-3) Readings and discussion of recent advances. Consult the departmental listing for offerings. May be repeated with consent of department. Maximum 9 hrs.

602 Seminar in Cell and Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

603 Seminar in Genetics (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

604 Seminar in Developmental Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

605 Seminar in Physiology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

606 Seminar in Aquatic Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

607 Seminar in Ecology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

608 Seminar in Ethology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

609 Seminar in Organic Evolution (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

610 Seminar in Population Dynamics (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

611 Seminar in Conservation Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

612 Seminar in Environmental Science (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

613 Seminar in Marine Science (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

614 Seminar in Environmental Policy (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

615 Seminar in Environmental Education (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

616 Seminar in Environmental Sociology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

617 Seminar in Environmental Economics (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

618 Seminar in Environmental Law (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

619 Seminar in Environmental Ethics (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

620 Seminar in Environmental Psychology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

621 Seminar in Environmental Anthropology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

622 Seminar in Environmental Geography (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

623 Seminar in Environmental History (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

624 Seminar in Environmental Art (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

625 Seminar in Environmental Literature (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.