Fields of Instruction

Accounting and Business Law
(College of Business Administration)

MAJORS
Accounting
Business Administration

DEGREES
M.Acc.
MBA, Ph.D.

Jan R. Williams, Head

Accounting

Professors:

Associate Professors:

Assistant Professors:

Distinguished Lecturer:
S. B. Wolfe, B.S. Virginia Polytechnic Institute.

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 perspective toward the discipline of accounting in a manner that will enable the student to spearhead innovation and change in response to needs in public accounting, business, industry, or government.

Foundation Requirements
Application deadlines for international students are: Fall, March 1; Spring, July 15; Summer, November 15. Application deadlines for U.S. citizens and permanent residents are: Fall, June 1; Spring, October 1; Summer, February 1. Although the program is designed for students who have completed an accredited baccalaureate degree program 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 course work in calculus and computer science. For students with no previous exposure to calculus, Mathematics 305 is available.

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

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

Accounting Concentration (12 hours):
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 University policy (page 20) may be credited toward M.Acc. degree requirements.

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

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

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

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 University policy (page 20) may be credited toward M.Acc. degree requirements.

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

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

MBA Concentration
Controllership: The concentration in controllership provides added accounting skills appropriate for those seeking employment in the controllership or general management functions of a variety of organizations. Although the concentration provides broad preparation for the Certified Management Accountants' examination, it is not designed to meet the minimum educational requirements to take the Certified Public Accountants' examination.
Minimum Course Requirements for MBA Concentration: 504, 505, 522, 541.

Ph.D. in Business Administration Concentration

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

Minimum Course Requirements for Ph.D. Concentration: 12 hours including 611, 612, 619, and one other accounting course to be approved by Ph.D. (accounting) program advisor.


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


505 Taxation for Business Decisions (4) Conceptual 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: 504 and Finance 501.


512 Selected Topics in Current Accounting Theory and Practice (3) Critical in-depth consideration of current and alternative solutions to emerging topics. Prereq: 511.

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

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

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

522 Budgetary Planning and Control Systems (3) Alternative approaches to 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: 321 or 503.

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

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

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

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

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

541 Database Systems (3) Design, implementation, and use of database systems for collection, organization, and distribution of economic information about organization. Prereq: 312 or 501; 321 or 503; 341 or Business Administration 506.

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

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

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

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

594 Graduate Seminar in Accounting (3) Topics vary. Prereq: Consent of instructor.

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

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

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

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

Business Law

Professors:

Associate Professor:
C. S. Massingale, MBA, J.D., Tennessee.

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

Advertising

(Majors in Accounting)

MAJOR

DEGREE

Communications ........................................ M.S.

Ronald E. Taylor, Head

Associate Professors:
D. Jackson, M.S. Tennessee; R. E. Taylor, Ph.D. Illinois.

Assistant Professors:
R. Howland, Ph.D. Illinois; M. J. Stankey, Ph.D. Illinois.

Instructor:
D. Kerr, M.A. North Carolina.

The Department of Advertising offers a concentration area for the Master's with a major in Communications. See Communications for additional information.

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 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

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

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

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

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

Agricultural and Extension Education
(College of Agriculture)

MAJOR DEGREE
Agricultural and Extension Education M.S.

Roy R. Lessy, Head

Professors:
Cecil E. Carter, Jr., Ph.D. Ohio State; Lewis Dickson, Ed.D. Cornell.

Associate Professors:

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

THE MASTER’S PROGRAM

Thesis Option
A candidate for the Master’s degree who elects the thesis option must successfully complete:
1. A minimum of 30 hours of graduate credit in courses approved by the student’s advisory committee. Only 6 hours of thesis credit in courses approved by the student’s advisory committee. Only 6 hours of thesis credit in courses approved by the student’s advisory committee. Only 6 hours of thesis credit in courses approved by the student’s advisory committee. Only 6 hours of thesis 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 course work 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.

411 Fundamentals of Agricultural Extension (3) History, philosophy, organizational structure, clientele served, major areas of program scope, teaching methods, and relationships with other educational agencies. Graduate credit for non-majors only. Sp
500 Thesis (1-15) P/NP only. E 5502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NP only. E

521 Extension Program Planning (2) Methods of developing county extension programs: sources of essential basic information, determination of problems and needs of people, functions of lay people and various groups of extension workers. Use of committees, step-by-step planning procedures, coordinated county and state plans and characteristics of effective programs. Prereq: 411 or consent of instructor. Sp
522 Extension Teaching Methods (2) Teaching/learning methods and techniques applicable to extension work, interrelationships and relative effectiveness. Result demonstrations, method demonstrations, meetings, tours, audio-visual aids. Prereq: 411 or consent of instructor. Sp
523 Extension Program Evaluation (2) Principles, instruments and techniques of identifying, gathering, analyzing and using data to appraise programs and teaching and tend to determine progress of clientele. Prereq: 411, 521, or consent of instructor. Sp
524 Research Methodology (3) Social research design, hypothesis testing, sampling, survey construction, scaling, interviewing, data coding, basic descriptive and relational statistics, and presentation of results. Prereq: 436, 523, or consent of instructor.
525 Curriculum Planning in Agricultural Education (3) Models, principles and procedures for developing curricula in agricultural education and scheduling learning activities for planned instructional program. Prereq: 435, 436 or consent of instructor.
526 Agricultural Education for First-Year Teachers (2) Developing competencies needed by first-year teachers for planning, organizing and conducting program of educational agriculture in the local community. Group meetings in selected centers and visits by instructor. Prereq: 435, 436. Sp
527 Adult Education and Strategies for Teaching (3) Psychological, philosophical and sociological theories for adult education in agriculture; methods and strategies for organizing classes and teaching adults. Prereq: 411, 436, or consent of instructor.
528 Advanced Techniques for Teaching Agricultural Mechanics (3) Teaching techniques; determining needed competencies; organizing and managing agricultural mechanics facilities. Prereq: 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 patterns and procedures for conducting programs for farm and off-farm agricultural occupations. Prereq: 435, 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.
531 Extension History, Philosophy and Objectives (3) Historical and philosophical foundation of adult education in American agriculture, key figures, issues, legislative movement, farmer organizations and programs. Cooperative Extension Service, origin, legislation and growth and nature of present 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
533 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.

Agricultural Economics and Rural Sociology (College of Agriculture)

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

Joe D. Martin, Head

Professors:
M. B. Badenhop, Ph.D. Purdue; J. R. Brooker, Ph.D. Florida; C. L. Cieland, Ph.D. Wisconsin; I. Dubov, Ph.D. California (Berkeley); D. B. Eastwood, Ph.D. Tufts; L. H. Keller, Ph.D. Kentucky; T. H. Klinck (Asst. Dean), Ph.D. Kentucky; F. O. Leuthold, Ph.D. Wisconsin; D. L. McLemore, Ph.D. Clemson; B. R. McManus, Ph.D. Purdue; J. A. Martin, Ph.D. Minnesota; S. D. Mundy, Ph.D. Tennessee; B. H. Penticoast (Asst. Vice Pres.), J. D. Tennessee; W. P. Ramsey (Emeritus), Ph.D. Minnesota; C. B. Sappington, Ph.D. Illinois; T. J. Whaley (Emeritus), Ph.D. Purdue.

Associate Professors:
B. C. English, Ph.D. Iowa State; R. H. Orr, Ph.D. Illinois; W. M. Park, Ph.D. Virginia Polytechnic Institute; R. K. Roberts, Ph.D. Iowa State; R. W. Todd; J. D. Tennessee.

Assistant Professors:
K. L. Haden, Ph.D. Oklahoma State; R. G. Huffaker, Ph.D. California (Davis); D. M. Markley, Ph.D. Virginia Polytechnic Institute; G. K. Pompeilli, Ph.D. California (Davis); L. W. VanTassell, Ph.D. Texas A&M.

The Department of Agricultural Economics and Rural Sociology offers programs of graduate study leading to the Ph.D. and M.S. The doctoral program includes concentrations in agricultural marketing and price analysis, agricultural policy, farm management and production economics, natural resource economics, and rural development. The M.S. program may be completed under a thesis option with concentrations in agricultural economics or rural sociology. A non-thesis option is available with a concentr-
Agricultural Economics

412 Agricultural Finance (3) Macro-finance, financial

414 Agricultural and Trade Policy (3) Values, goals, and policy process; historical development and current characteristics of commodity, credit, and trade policy; relationship between domestic and international agricultural policy. Prereq: Economics 201; junior standing or consent of instructor. F

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

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

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

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

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

470 Natural Resource Economics (3) Nature of natural resources; economic efficiency as basis for natural resource use; externalities 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

483 Independent Study in Agricultural Economics (1-15) 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/NP only. E

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

520 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, integer and quadratic programming techniques with empirical applications to problems of firm and region; price maximization, cost minimization, intermediate input/output, risk, allocation over space and time. Prereq: Consent of instructor. F

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

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 system; application of price theory concepts to existing circumstances in agricultural industries; examination of methods used to evaluate conduct and performance; analysis of transportation issues and location theory. Prereq: Economics 511 or consent of instructor. F

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: 460 or consent of instructor. Sp

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

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

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

620 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 Operations Analysis in Marketing (2) Components and functions of marketing system, level of analysis and tools, operational efficiency, interregional competition. Prereq: 450 and 550 or consent of instructor. Sp,A

652 Consumer Demand and Food Consumption (2) Simultaneity of consumer decision making; food demand. 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. F,A

Rural Sociology

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

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

593 Special Topics in Rural Sociology (1-3) Current sociological issues involving application of sociological

THE MASTER'S PROGRAM

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

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

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

THE DOCTORAL PROGRAM
A minimum of 78 hours of graduate credit beyond the B.S. degree, including 24 hours of dissertation research, but excluding any Master's research credit, is required. A minimum of 15 hours in agricultural economics, 15 hours of economic theory, and 9 hours of quantitative methods are required. The program must include a minimum of 8 hours in courses numbered at or above the 600 level (excluding dissertation credits). Comprehensive exams include four written exams and one oral exam. The written exams are in general agricultural economics, economic theory, quantitative methods, and the area of concentration. Provisions exist for waiving the economic theory exam with a sufficient academic record in specific economic theory courses.

Minor
A minor will consist of a minimum of 9 hours of course work taken in the department and approved by the minor professor. At least 6 hours of credit in the minor area will be in 500- and 600-level courses.
Agricultural Engineering

(College of Agriculture)

MAJORS

DEGREES

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

D. Houston Luttrell, Head

Professors:

B. L. Bledsoe (Associate Head), Ph.D. 
Oklahoma State, P.E.; Z. A. Henry, Ph.D. 
North Carolina State, P.E.; D. H. Luttrell, 
Ph.D. Iowa State; J. J. McDow, Ph.D. 
Dean), Ph.D. North Carolina State, P.E.; 
C. H. Shelton, M.S. Virginia Polytechnic 
Institute; F. D. Tompkins, Ph.D. Tennessee, 
P.E.; L. R. Wilhelm, Ph.D. Tennessee, P.E.

Associate Professors:

R. D. vonBernuth, Ph.D. Nebraska, P.E.; 
C. R. Mote, Ph.D. Ohio State, P.E.

Assistant Professor:

D. O. Baxter, M.S. Missouri.

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 prerequisites before entering a program. The student's program of study must be approved by his/her advisory committee and must comply with the requirements of the Graduate School.

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

THE MASTER'S PROGRAMS

Agricultural Engineering Requirements

1. A total of at least 24 hours credit in graduate coursework in agricultural engineering and related areas. The minimum requirements are 12 hours in agricultural engineering; 9 hours in other engineering, mathematics, physical and biological science, agricultural, or business areas (as approved by the advisory committee) and 3 optional hours from either one of these categories.

2. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering 510 and must attend the graduate seminar each semester whether registered or not.

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

4. A final oral examination covering the thesis, related areas, and graduate course work.

Agricultural Engineering Technology Requirements

1. A total of at least 24 hours in graduate course work in Agricultural Engineering Technology and related areas. Minimum requirements are 12 hours in agricultural engineering, 9 hours in either agricultural, business, physical and biological science, or engineering-related areas (as approved by the graduate committee) and 3 optional hours from either one of these categories.

2. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering Technology 530 and must attend the graduate seminar each semester whether registered or not.

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

4. A final oral examination covering the thesis, related areas, and graduate course work.

5. A minor in another subject area can be included in the program.

THE DOCTORAL PROGRAM

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

Departmental Requirements

1. A minimum of 72 hours credit beyond the Bachelor's degree, excluding credit for the Master's thesis. Of this, 24 hours must be 600 Doctoral Research and Dissertation. Graduate courses in agricultural engineering comprising a minimum of 18 hours credit.

2. Supporting graduate courses (outside the Agricultural Engineering Department) in related engineering, agricultural, mathematical, and other scientific fields comprising at least 24 hours. The remaining minimum of 6 hours required for the degree may be taken either in agricultural engineering or related fields.

3. A minimum of 24 hours from course work numbered greater than 500, of which at least 9 hours must be in courses numbered greater than 600.

4. Active participation in graduate seminars conducted by the department. Resident students must register for a minimum of 2 hours in Agricultural Engineering 610 and must attend the graduate seminar each semester whether registered or not.

5. A final oral examination covering both written and oral comprehensive examinations prior to admission to candidacy. A final oral examination also is required which includes a defense of the dissertation and subject matter that the student's graduate advisory committee considers appropriate.
Agricultural Engineering Technology

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

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

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

502 Registration for Use of Facilities (3-15) Required of all graduate students. May be repeated. Maximum 6 hrs. Sp, A

506 and computer programming course. 2 hrs and 1 lab. Sp, A

546 Automation Devices and Applications (3) Electrical and fluid control systems. Basic electronics as applied to simple automation systems, programmable controllers, and flow transducers. Prereq: 506 and computer programming course. 2 hrs and 1 lab. Sp, A

552 Seminar (1) Current research and literature related to agricultural production technology. May be repeated. Maximum 3 hrs. E

552 Selected Topics in Agricultural Engineering Technology (1-3) Current trends and problems in agricultural production technology. May be repeated. Maximum 6 hrs. E

Agriculture

(College of Agriculture)

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

Animal Science

(College of Agriculture and College of Veterinary Medicine)

MAJOR DEGREES

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

Don O. Richardson, Head

Professors:

K. M. Barth, Ph.D. Rutgers; M. C. Bell (Emeritus), Ph.D. Oklahoma State; J. K. Bletter (Emeritus), Ph.D. Ohio State; C. C. Chamberlain (Emeritus), Ph.D. Iowa State; B. H. Erickson, Ph.D. Kansas State; O. G. Hall (Dean), Ph.D. Iowa State; S. L. Harsand (Emeritus), Ph.D. Florida; E. R. Livvall, M. S. Tennessee;

T. P. McDonald, Ph.D. Tennessee;

J. B. McLaren, Ph.D. Auburn; G. M. Merriman (Emeritus), D.V.M. Michigan State;

J. K. Miller, Ph.D. Georgia;

M. J. Montgomery, Ph.D. Wisconsin;

R. L. Murphy (Emeritus), Ph.D. Wisconsin;

D. O. Richardson, Ph.D. Ohio State;

H. V. Shirley, Ph.D. Illinois; R. R. Shrode, Ph.D. Iowa State; R. L. Tugwell (Emeritus), Ph.D. Kansas State.

Associate Professors:


J. P. Hitchcock, Ph.D. Michigan State;

H. G. Kattesh, Ph.D. Virginia Polytechnic Institute; F. B. Masincupp, Ph.D. Kansas State; K. R. Robbins, Ph.D. Illinois;

T. W. Schultz, Ph.D. Tennessee; M. H. Sims, Ph.D. Auburn; J. C. Waller, Ph.D. Nebraska.

Assistant Professors:

G. A. Baumbach, Ph.D. Florida; B. R. Bell, Ph.D. North Carolina State; A. B. Chestnut, Ph.D. Illinois; W. C. Cullen, Ph.D. Minnesota;

J. D. Godkin, Ph.D. Massachusetts;

S. P. Oliver, Ph.D. Ohio State; S. E. Orosz, D.V.M., Ph.D. Ohio State; J. D. Smalling, Ph.D. Texas A & M.

Animal Science

The Department of Animal Science offers graduate programs leading to the Master of Science and Doctor of Philosophy in major in Animal Science. At the M.S. level, areas of concentration are nutrition, breeding, physiology (reproductive, mamma-
ry, and metabolic), and management with orientation towards beef cattle, dairy cattle, swine, and poultry. Since this 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 concentration in animal nutrition, animal breeding, animal physiology, animal anatomy, and animal management. For specific information, contact the department head.

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

THE MASTER'S PROGRAM

The program requires the writing of a thesis based on original research; the completion of a minimum of 24 hours of graduate course work, of which at least 14 hours must be taken in courses numbered at or above the 500 level; and a minimum of 6 hours of thesis. Included in the course requirement is a quarter of 595 each spring term.

THE DOCTORAL PROGRAM

The doctoral program requires a minimum of 48 semester hours of course work beyond the B.S. and a minimum of 24 hours of doctoral research and dissertation. Students must present their M.S. thesis research, their dissertation proposal, and the completed dissertation research in the departmental seminar. The 48 hours of course work must include:
1. A minimum of 18 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 581 and 9 hours at the 500 or 600 level in two non-management concentrations for a total of 12 hours (including 581).
3. A minimum of 1 hour of Agriculture 512 in addition to that required at the M.S. level.
4. A minimum of 6 hours in 400-, 500-, or 600-level statistics courses approved for the IGOSP.

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 personal goals. The advisory committee approves the course work and the dissertation research proposal and determines if there is to be a foreign language requirement. The advisory committee committee the comprehensive written and oral examination and the final dissertation defense examination.

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

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

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

484 Poultry Production and Management (3) Structure of poultry enterprises: rearing, housing, feeding, production, and management. Prereq: Animal science sophomore and junior core courses or consent of instructor. 2 hrs and 1 lab. F

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

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

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

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

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

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

531 Analytical Techniques in Animal Sciences (3) Physical and chemical analyses of feeds, ingredients, tissues, and biological fluids associated with nutrition, physiology and food products research. Prereq: Consent of instructor. 1 hr and 2 labs. F

532 Experimental Techniques in Animal Nutrition (3) Animal experimental techniques and concepts for growth, digestion, behavior, and tracer studies. Prereq: 531. 1 hr and 2 labs. Sp

533 Nonruminant Animal Nutrition (3) Physiological development in digestive system of nonruminant animal during the life cycle. Concepts and methodology concerning nutritional interrelationships, availability and deficiencies of nutrients. Nutritional additives and environmental effects on nutrient utilization; nutrition and livestock products. Prereq: 322 or consent of instructor. F

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

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

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

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

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

573 Intermediate Statistical Computing (2) Application of statistical procedures to analysis and handling of data using computer packages for assessing some of the hardware; statistical analysis methods with high speed digital computers. Prereq: 521 or equivalent; knowledge of how to use mainframe and software package. 2 hrs and 1 lab. F

581 Advanced Livestock Management (3) Objective functions to evaluate alternative livestock management policies. Systems approach to analysis and integration of reproductive management programs, genetic improvement policies, alternative feeding systems, programs, carcass quality, and economics. Prereq: 521. E

590 600 Doctoral Research and Dissertation (3-15) Prereq: Consent of instructor and department head. May be repeated. Maximum 5 hrs. S/NC only. Sp

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

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

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

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 minerals and vitamins. Prereq: 533 or 534, and Biochemistry 410 or Nutrition 511 or consent of instructor. F,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. F,A

641 Advanced Topics in Animal Breeding (1-4) Advances and concepts, research techniques, current problems. Prereq: 542 or equivalent. May be repeated. Maximum 6 hrs. E

642 Quantitative Breeding Research Methods and Interpretation (2) Estimation of genetic parameters: phenotypic, genetic, and environmental correlations; repeatability; heritability; and selection indexes from simulated and actual data. Prereq: 542. 1 hr and 1 lab. Sp,A

671 Advanced Research Planning (3) (Same as Plant and Soil Science 671).

671 Advanced Research Planning (3) (Same as Plant and Soil Science 671).

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

Animal Science—Veterinary Medicine

See Veterinary Medicine for program description.

PROFESSIONAL COURSES

821-22 Anatomy I, II (4,4) Gross and applied anatomy: neural structures of common domestic animals: dog, cat, horse, cow. Dissection of embalmed specimens, procedures, slides, models, and living animals.

823-24 Physiology I, II (4,4) Introduction to concepts and problems in physiology which form base for clinical investigations and for formal training in pharmacology, medicine, pathology, and surgery. Cellular, neural, cardiovascular, renal, respiratory, digestivel, endocrine, and reproductive physiology.

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. May be repeated. S/NC only. E

521 Animal Physiology (4) Introduction to 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, and biochemistry, or consent of instructor. 3 hrs and 1 lab.

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

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

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

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


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

651 Disorders of the Endocrine System (2) Pathological physiological aspects of diseases; endocrine glands of various animal species. Prereq: 521 or consent of instructor. May be repeated. Maximum 5 hrs. E

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

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

Associate Professors:
J. E. Harrison, Ph.D. Syracuse; B. J. Howell, Ph.D. Kentuck; W. E. Klippel, Ph.D. Missouri; M. H. Logan, Ph.D. Pennsylvania State; G. F. Schroedi, Ph.D. Washington State.

Assistant Professors:
J. F. Simek, Ph.D. SUNY-Binghampton; P. S. Willey, Ph.D. Tennessee.

Instructor:
M. A. Bass (part-time), Ph.D. Kansas State.

Research Associate Professor:

Research Assistant Professors:
M. O. Smith, Ph.D. Tennessee; S. D. Tardif, Ph.D. Michigan State.

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

The Master's Program

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

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

   These requirements must be met prior to taking the Graduate Evaluation Examination.
2. Successful completion of the departmentally developed Graduate Evaluation Examination (GEE). It is expected that it will be taken at the end of the third semester in residence. The GEE is given each year in January.
3. An introductory statistics course (usually Statistics 531) if such a course has not been previously taken.
4. Successful completion of the thesis and final oral examination.

The Doctoral Program

An incoming student should possess an M.A. in Anthropology. Students with an M.A. in another discipline may be admitted after completing specific requirements outlined in the departmental brochure. In addition to the requirements prescribed by The Graduate School for the Ph.D., the Anthropology Department requires the following:
1. Formation of an advisory committee and establishment of a program of study in consultation with the committee.
2. No minimum credit hour requirement. Specific courses to be taken are determined by students and their advisory committees. 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 specialized reading courses for graduate students with a grade of B or better.
5. Written and oral comprehensive examinations in three areas of specialization to be determined by the committee.

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 cases. Prereq: 130.

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

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

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

440 Cultural Ecology (3) Concepts and methods in studying dynamic interaction between prehistoric and present day cultures and their environments: ecological theory, methods 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.

460 Selected Topics in Archaeology (3) Regional or theoretical issues in archaeology for undergraduate students. Practical experience in laboratory study of archaeological materials. Prereq: 120 or consent of instructor. May be repeated. Maximum 6 hrs.

481 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 481.)

482 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.

483 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.

Anthropology

(College of Liberal Arts)

Major Degrees

Anthropology

William M. Bass, Head

Professors:
W. M. Bass, Ph.D. Pennsylvania;
C. H. Faulkner, Ph.D. Indiana; R. L. Jantz, Ph.D. Kansas; P. W. Parmalee, Ph.D. Texas
A. M. F. H. Smith, Ph.D. Michigan;
M. C. Wheeler (part-time), Ph.D. Yale.

Grades of General Knowledge in Another Language

The Department of Anthropology requires the following:
1. Formation of an advisory committee
2. Establishment of a program of study in consultation with the committee
3. No minimum credit hour requirement
4. Specific courses to be taken are determined by students and their advisory committees
5. Students should plan to devote 4 years beyond the B.A. to attain the Ph.D.
6. Demonstration of competence in statistics by completing Statistics 531 and 532 with a grade of B or better
7. 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
8. This requirement may be met by:
   a. Successful performance on a language examination administered by the appropriate language department
   b. Completion of the intermediate (200 level) sequence of a language with a grade of B or better in the second semester
   c. Completion of the second semester of specialized reading courses for graduate students with a grade of B or better
   d. Written and oral comprehensive examinations in three areas of specialization to be determined by the committee
   e. Successful completion of a dissertation and final oral examination
464 Principles of Zooarchaeology (3) Basic osteological study of prehistoric human/-faunal relationships and their significance for understanding human behavior, subsistence, and paleo-environmental reconstruction. Prereq: Consent of instructor.

465 Principles of Paleoanthropology (3) Study of human evolution and prehistory, focusing on the hominid fossil record, human adaptations, and the diversity of human evolution. Prereq: 464 or consent of instructor.

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

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

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

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

511 Special Topics in Cultural Anthropology (3-5) Seminar for advanced study on topics of special interest. May be repeated. Maximum 6 hrs.

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

513 Rural Studies in Anthropology (3) Application of rural studies to human ecology, and cultural behavior. Prereq: Consent of instructor.

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

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

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

521 Laboratory Studies in Zooroarchaeology (3) Examination of skeletal remains of major vertebrate groups, shells of terrestrial and aquatic mollusks, in relation to human remains from archaeological contexts. Biological anthropology, paleoecology and prehistoric faunal remains encountered in archaeological sites; use of comparative collections. May be repeated. Maximum 8 hrs.

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

530 Fieldwork in Archaeology (3-5) 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 evaluated 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 and relationships of federal and state agencies, public interest groups, and professional archaeologists in conduct of federally sponsored archaeology. May be repeated. Maximum 6 hrs.

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

563 Problems in New World Archaeology (3) (Same as Classics 563.)

564 Archaeology of Southeastern United States (3) Archaeological research and cultural history of American Indian cultures in Southeastern United States; Tennessee prehistory.

565 Archaeology of Northeastern United States (3) Archaeological research and cultural history of American Indian cultures in Northeastern United States; New England prehistory.

566 Problems in Southwestern Archaeology (3) (Same as Classics 566.)

567 Problems in Northern and Middle American Archaeology (3) (Same as Classics 567.)

568 Problems in Andean and North American Archaeology (3) (Same as Classics 568.)

569 Problems in Mesoamerican Archaeology (3) (Same as Classics 569.)

570 Problems in South American Archaeology (3) (Same as Classics 570.)

571 Problems in East and South-East Asian Archaeology (3) (Same as Classics 571.)

572 Problems in South and East African Archaeology (3) (Same as Classics 572.)

573 Problems in Near Eastern Archaeology (3) (Same as Classics 573.)

574 Problems in South and East Asian Archaeology (3) (Same as Classics 574.)

575 Problems in Western Africa Archaeology (3) (Same as Classics 575.)

576 Problems in North and South American American Archaeology (3) (Same as Classics 576.)

577 Problems in North Africa Archaeology (3) (Same as Classics 577.)

578 Problems in Central Africa Archaeology (3) (Same as Classics 578.)

579 Problems in Anthropology of Modern Urban Societies (3) (Same as Classics 579.)

580 Advanced Human Variation (3) Genetic and morphological variation among extant human groups; relations 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.

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

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

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

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

610 Seminar in Cultural Anthropology (3) Selected topics for doctoral study in cultural anthropology. Prereq: Consent of instructor. 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 Anthropology (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.

Architecture

Office of the Provost

Roy F. Knight, Dean
William J. Lauer, Associate Dean
Jon Coddington, Assistant to the Dean

Professors:


Associate Professors:

M. D. Herz, B. Arch. Columbia; S. A. Kinzy, M. Arch. Illinois; W. E. Martelba, B. Arch. California (Berkeley); M. S. Moffett, Ph. D. Massachusetts Institute of Technology; Y. Narancic, B. Arch. Belgrade; J. S. Rabun, M. A. Texas.

Assistant Professors:


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

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

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

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

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

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

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

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

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

410 History and Theory of Urban Form (3) Patterns of community development. 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. Pre-historic times to present throughout world. Fertile Crescent; Indus Valley; Hindu, Buddhist, and Mughal architectures of India, China, and Japan.

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

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

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


420 American Architecture II (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 of Czechoslovakia, Poland, Hungary, East Germany, Romania, Bulgaria, Yugoslavia.

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


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

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

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

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

Art (College of Liberal Arts)

MAJOR DEGREE

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

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

Professors:

Associate Professors:
P. M. Brakke, M.F.A. Yale; R. H. Daehnert, M.F.A. Wisconsin; J. F. Darrow, Ed.D. Illinois State; M. B. Goldenstein, M.F.A., Nebraska; B. Lee, M.F.A. Yale; R. LeFevre, M.F.A. Rochester Institute of Technology; F. Moffat, Ph.D. Chicago; T. J. Riesing, M.F.A.

Nebraska; S. Yates, M.F.A. North Carolina (Greensboro).

Assistant Professors:

Instructor:
D. Wilson, M.F.A. California (San Diego).

The Master of Fine Arts is the terminal degree in studio art. It is offered in the concentration areas of ceramics, graphic design/illustration, drawing, fiber-fabrics, printmaking, sculpture, and watercolor. Inter-area studies are available with consent of the faculty. In order to become a candidate, the applicant must be admitted by The Graduate School and approved by the Department of Art. In addition to the admission requirements of The Graduate School, the Department of Art specifically requires the following:

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

M.F.A. REQUIREMENTS

A minimum of 60 hours is required:

1. Successful completion of 20 hours of study in a concentration area. An inter-area program must be approved by the graduate faculty only after the second semester in residence. Ten hours of concentration must be in second year courses (512, 514, etc.)
2. A minimum of 9 hours of art history for graduate credit.
3. Eleven hours of electives which may consist of any combination of courses offered by the University for graduate credit.

Art 599, Project in Lieu of Thesis (20 hours). A third year of semi-independent study. Student must have completed all other course work prior to registration.

A student with the permission of the area faculty can petition to take 3 hours of outside academics as a substitute for 3 hours of art history or 3 hours of concentration area. The petition is to be presented to the graduate committee for final approval and should directly address the need and relevance of this substitution to the student's concentration.

Four semesters beyond the Bachelor's degree are required in residence. Residence is defined by the Department of Art as (1) a minimum enrollment of 6 hours per semester and (2) use of Department of Art facilities so that students are available for discussion and criticism.

The candidate's committee will consist of a minimum of 3 members and a maximum of 6 members and will be appointed prior to registration for Art 599. Three members of the committee shall be as follows: one from the candidate's concentration area who shall be the major professor, one from art history, and one from a studio discipline outside the candidate's concentration area.

Exhibition and oral examination: With the
244 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.
245 History of Ceramics Seminar (3) Ceramics from ancient through contemporary. Ceramics sculpture, and vessel aesthetic; Slide lectures and individual presentations. May not be used toward art history requirement. Prereq: 321 and 322.
246 Kilns: Design, Construction and Operation (3) Designing kilns, traditional and modern refractories, construction methods, and operation of wood, gas, and electric kilns. Prereq: 331 and 332.
249 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.
253 Advertising Illustration (3) Advertising illustration media and techniques as applied to product illustration. Prereq: 354.
254 Editorial Illustration (3) Editorial illustration media and techniques as applied to book, magazine, and newspaper illustration. Prereq: 453.
256 Graphic Design/Illustration Practicum (1-12) Practical experience in graphic design and illustration field. Only by prearrangement with department. Prereq: Senior standing and consent of instructor. May be repeated. Maximum 12 hrs.
259 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.
262 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.
263 Lithography III (3-6) Individual projects through advanced color etching methods from stones and aluminum plates. Prereq: 363. May be repeated. Maximum 12 hrs.
269 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.
271 History of North American Art (3) Landmarks in painting, architecture, sculpture, and design from prehis-
Art and Music Education

(college of Education)

MAJORS

Art Education ........................................ M.S.
Music Education ..................................... M.S.

Charles H. Ball, Head

Professors:


Associate Professors:


Assistant Professor:

J. R. Sparks, M.S. Tennessee.

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

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

Art Education

The Master of Science program requires Art Education 510, 520, and 593; 6 hours of 500-level courses in art history; 6 hours of 500-level courses in studio art; Curriculum and Instruction 580; 6 hours of 500-level elective courses in education; and 6 hours of Thesis 500.

The thesis may be of the conventional type or an exhibition of original works of art produced under the direction of Art and Art Education faculty and accompanied by a written analytical and critical essay. This essay must include a) a philosophical statement, b) an explanation of process and media for each work presented, and c) a compositional analysis of each work. A comprehensive written examination will be required during the final semester of work.

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 repeatable. S/NC only. E

510 History and Philosophy of Art Education (3) United States from 1880's to present. Prereq: Consent of instructor.

520 Program Development in Art Education (3) Curriculum and procedures in art education: unit planning, sequential organization and teaching methods. Prereq: Consent of instructor.

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

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

Music Education

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

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

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

500 Thesis (1-15) P/NP only. E
Audiology and Speech Pathology

**College of Liberal Arts**

**MAJORS**

<table>
<thead>
<tr>
<th>Degree</th>
<th>MA</th>
<th>M.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech and Hearing Science</td>
<td>Ph.D.</td>
<td>Speech Pathology</td>
</tr>
</tbody>
</table>

**Professors:**

S. Adler, Ph.D. Ohio State; C. W. Asp, Ph.D. Ohio State; P. J. Carney, Ph.D. Iowa; H. L. Luper, Ph.D. Ohio State; T. Nabelek, Sc. D.; Prague; H. A. Peterson, Ph.D. Illinois; B. Silverstein, Ph.D. Purdue.

**Associate Professors:**

S. B. Burchfield, Ph.D. Michigan State; A. O. Diefendorf, Ph.D. Washington; C. J. Ferrell, M.A. Tennessee; E. Hamby, Ph.D. Iowa.

**Assistant Professor:**

D. Arthur, M.A. Tennessee.

**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 content 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 150 hours as a graduate student, 300 total). An exception to this rule must be approved by the appropriate department committee.

Enrollment in clinical practicum courses is required for all clinical experience. If the undergraduate preparation does not include sufficient course work in speech pathology, audiology, psychology, and related fields, the student may be required to make up such deficiencies.

Students may elect either the thesis or the non-thesis option. Students in both programs are required to take 511 and 517. The Master's program with the thesis will include a minimum of 30 semester hours of approved graduate credit, including 6 hours of 500 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least two-thirds of these total courses must be at the 500 or 600 level; no more than 6 hours of thesis courses and no more than 6 hours of practicum. Students in the non-thesis option program must present a total of 36 semester hours of approved graduate credit and pass a final written examination. A minimum of 24 hours must be at the 500 or 600 level, no more than 8 of which may be practicum. The thesis as to choice of the thesis or non-thesis program is normally made following completion of 511 and a conference with the student’s advisor.

**THE DOCTORAL PROGRAM**

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

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

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

Specific programs of study will be determined by the student in consultation with his/her faculty committee. In addition to the general Graduate School requirements, specific requirements for the Doctor of Philosophy in Speech and Hearing Science will include:

1. Successful completion of course work in the study of one or more research tools or other specific scientific methodological vehicles pertinent to the research interests of the candidate. The choice of research tool(s) is subject to departmental approval.
2. A minimum of 6 semester hours of graduate credit obtained in a course work in a cognate field outside the Department of Audiology and Speech Pathology. These hours are in addition to those required in item 1 above.
3. Sufficient course work within the department but outside the area of concentration to give a broad foundation and understanding.
4. A comprehensive examination to demonstrate scholarly knowledge of audiology, speech and language pathologies, and speech and hearing science; and advanced knowledge of the specifics of the area of concentration.
5. Research and dissertation to give at least 24 hours of graduate credit (600 level).
6. A final oral examination.
473 Audiology II (3) Basic principles of clinical audiology: Pure tones, speech, masking and overview of special auditory tests. Prereq: 371. (Same as Special Education 473.)

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

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

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

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

507 Anatomy and Physiology of the Ear (3) Structure and function of human ear. Prereq: 371.

508 Electrophysiological Assessment of Auditory Function (3) Techniques for electrophysiological measurement of auditory sensitivity, sound transmission by ear, distortion in ear and ear as analytic mechanism. Prereq: consent of instructor.

511 Introduction to Research in Speech and Hearing (2) Analysis of research techniques, application of statistics, and completion of pilot research project. Psychology. Prereq: 385 or equivalent or consent of instructor.

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

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

514 Practicum in Verbo-Tonal Habilitation (1-4) Prereq: 494, 505, or consent of instructor. May be repeated. Maximum 8 hrs.

515 Practicum in Aural Rehabilitation (1-4) Prereq: 473 and 494. May be repeated. Maximum 8 hrs.

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

520 Aphasia (3) Historical review of aphasia literature, theories of brain functioning, aphasic classification and terminology, tests and rationale for testing, etiology, therapy considerations and prognosis for recovery. Prereq: 526 or equivalent or consent of instructor.

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

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

532-33-34 Advanced Clinical Practice in Speech-Language Pathology (3) Prereq: 1-4, 1-4, 1-4) Prereq: 334 or equivalent and consent of instructor. 534 may be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

535-36-37 Advanced Clinical Practice in Speech-Language Pathology: Off-Campus Sites (1-4, 1-4, 1-4) Prereq: 494, 505, or equivalent or consent of instructor. 534 may be repeated. Maximum 6 hrs. Enrollment for less than 2 hrs must have prior departmental approval.

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

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


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

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

547 Special Problems in Audiology (1-3) Prereq: 473 or equivalent and consent of instructor. May be repeated. Maximum 9 hrs.

548 Special Study in Audiology (1-3) Special reading, consultation, and research activities in field of audiology. May be repeated. Maximum 6 hrs.

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

551 Special Auditory Tests (3) Theoretical and practical considerations of audiological procedures used for differentiating among conductive, cochlear, retrocochlear, central and nonorganic hearing loss. Prereq: 473,507, and 546.

552 Seminar in Speech Pathology (2-3) Current significant research in speech pathology. Topics vary. Prereq: 9 hrs in speech pathology. May be repeated with consent of department. Maximum 9 hrs.


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

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

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

561 Tutorial in Child Language Pathology (2) Interactions with various staff members of Pediatric Language Programs; selected topics.

573 Hearing Disorders (3) Auditory disorders commonly encountered in medical environment. Etiology, pathology and evaluative procedures to differentiate lesions of auditory mechanism. Field trips may be required. Prereq: 473 or equivalent and 507.

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

576 Directed Study in Speech Science (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

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

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

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

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

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


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


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

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

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

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

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

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

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

658 Directed Research (1-3) Participation in ongoing or non-dissertational research. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

657 Directed Study in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

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

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

660 Directed Study in Hearing Science (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.
**Aviation Systems**

*(College of Engineering)*

**MAJOR** 
Aviation Systems .................................................. M.S.

Lead Professor: 
R. D. Kimberlin, M.S. Tennessee.

Professors: 
F. G. Collins, Ph.D. California (Berkeley); W. Frost, Ph.D. Washington; A. A. Mason, Ph.D. Northwestern; J. M. Wu, Ph.D. California Institute of Technology; R. L. Young, Ph.D. Northwestern.

The University of Tennessee Space Institute offers a program leading to the Master of Science 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 who wish to study under a "systems philosophy" toward careers in research and development or administration in areas pertinent to aviation.

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

Both thesis and non-thesis programs are available. The thesis program involves satisfactory completion of the following requirements:

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering for the research and development area.
3. Three hours in industrial engineering or economics for the administration area.
4. Three to 6 hours of electives selected from the major field, engineering, and/or the areas of item three (3) above.
5. Six hours of Aviation Systems 500 demonstrating the ability to conduct and report on an independent investigation.

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

1. Twelve hours of 500-level courses in the major field of aviation systems.
2. Six hours in industrial engineering for the research and development area.
3. Nine hours in industrial engineering, economics, or finance for the administration area.
4. Nine to 12 hours of electives in the major field, engineering, and/or the areas of item three (3) above.
5. Satisfactory completion of an assigned project under Aviation Systems 510.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper.

The thesis program involves a minimum of 30 semester hours credit while the non-thesis program involves a minimum of 30 semester hours credit.

---

**Biochemistry**

*(College of Liberal Arts)*

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

Wesley D. Wicks, Head

Professors: 
J. E. Churchich, Ph.D. Sheffield (England); L. Huang, Ph.D. Michigan State; P. D. Joshi, Ph.D. Poona (India); K. J. Monty, Ph.D. Rochester; T. P. Salo (Emeritus), Ph.D. Michigan; W. D. Wicks, Ph.D. Harvard.

Assistant Professors: 
R. H. Feinberg (Emeritus), Ph.D. California (Berkeley); J. W. Koontz, Ph.D. Kentucky.

Adjunct Faculty: 
E. Fairfield, Ph.D. Stony Brook; W. Farkas, Ph.D. Duke; S. Kennel, Ph.D. California (San Diego); D. Roberts, Ph.D. California (Davis).

**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 in the following: 601, 603, 604, 605, 606, 607.
5. At least 6 hours of Master's research and a thesis.
6. A final examination that covers both the thesis endeavors and the subject matter of the course requirements.

**THE DOCTORAL PROGRAM**

1. Introductory Organic Chemistry*, Introductory Physics*, Differential and Integral Calculus*, approved physical chemistry, and at least 12 hours of biology beyond the introductory level and including the subject areas of genetics and physiology.
2. Biochemistry 511-12 and 515-16.
3. At least 3 hours of approved graduate courses in chemistry, physics, or other physical science; for example, Chemistry 550, 551, 552, Physics 521, 522, 525. No survey courses will be accepted.
4. At least 6 hours of topics offered in 621 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 terminal candidacy.
8. A final oral examination which will be concerned primarily with the student's dissertation.

**Petitioning for Master's Degree**

Students who have passed the comprehensive examination in the Ph.D. program and have completed at least 30 hours of approved course work 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.

*Though completion of these courses or their equivalent is required, they may not be taken for graduate credit.*
410 Cellular and Comparative Biochemistry (4) Electrotyle behavior; chemistry and structure of proteins; enzymes and their properties; intermediary metabolism and energy capture; synthetic metabolism; nucleic acid function, protein synthesis, and biochemical genetics. Prereq: Chemistry 350-60-69 and Biology 110-20. 3 hrs and 1 discussion. F,Sp.


430-40 Introduction to Physical Biochemistry (3,3) Development of concepts from physical chemistry for application to biological problems. 430-Thermodynamics; intermediation; molecular motors; transport; shape and motion of macromolecules; kinetics of enzyme-catalyzed reactions. 440-Quantum mechanics; molecular motion of macromolecules; kinetics of enzyme-catalyzed reactions. Prereq: 410 or equivalent. May be repeated. Maximum 4 hrs. (Same as Ecology 604.) S/NC only. F,Sp.


466 Current Topics in Biological Membrane Research (1) Prereq: 410 or equivalent. May be repeated. Maximum 4 hrs. (Same as Microbiology 605.) S/NC only. F,Sp.

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

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

516 Experimental Techniques II (3) Laboratory rotatory. Student works in laboratory of faculty member on clearly defined project. Written proposal and oral report. Primarily for departmental graduate students. Prereq: 515. Sp.

521 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated. Maximum 9 hrs.

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

561 Environmental Toxicology (3) Basic concepts in toxicology; molecular toxicology and detoxification; receptor action; toxogenesis; mutagenesis, teratogenesis, carcinogenesis; pathologic changes and environmental impact. Prereq: 410. Chemistry 350-60-69 or consent of instructor. (Same as Ecology 561) F.

562 Techniques in Environmental Toxicology (1) Experimental techniques for assessment of presence, toxicity, and impacts of pollutants in global ecosystem. Laboratory exercises on analytical, biochemical, and bioassay methods in toxicological studies. Prereq: 419 or (quantitative reasoning) 561 and Chemistry 350-60-69. (Same as Ecology 562.) Sp.

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


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

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

Biomedical Sciences

Office of the Provost

MAJOR DEGREES

Biomedical Sciences M.S., Ph.D.

Raymond A. Popp, Acting Director

Professors:
D. Billen, Ph.D. Tennessee; D. E. Clinis, Ph.D.

Rockefeller.

Assistant Professor:
C. Soumoff, Ph.D. California (Los Angeles).

Research Professor:

Research Associate Professor:

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

W. E. Barnett, Ph.D. Florida State; H. I. Adler, Ph.D. Cornell; D. P. Allison, M.S. Tennessee; G. Bunick, Ph.D. Pennsylvania; W. L. Carrier, M.S. Tennessee; J. S. Cook, Ph.D. Princeton; J. N. Dumont, Ph.D. Massachusetts; J. L. Epier, Ph.D. Florida State; R. J. Fry, M.D. Dublin (Ohio); R. K. Fujimura, Ph.D. Wisconsin; C. W. Gehrs, Ph.D. Nebraska; W. M. Generoso, Ph.D. Johns Hopkins; W. C. Gosslee, Ph.D. North Carolina State; R. A. Griesemer, D.V.M. Ohio State; A. H. Hartman, Ph.D. Tennessee Medical Units; A. W. Heise, Ph.D. Indiana; K. B. Jacobson, Ph.D. Johns Hopkins; S. Kenne, Ph.D. California (San Diego); F. T. Kenney, Ph.D. Johns Hopkins; P. A. Lealley, Ph.D. New York (Buffalo); W. L. Liner, Ph.D. Florida State; A. H. Levy, Ph.D. California Institute of Technology; C. L. Stevens, Ph.D. Connecticut; P. Mazur, Ph.D. Harvard; J. T. Mitchell, Ph.D.

Wisconsin; S. Mitra, Ph.D. Wisconsin; S. K. Niyogi, Ph.D. Northwestern; B. C. Pal, Ph.D. Calcutta (India); E. H. Perkins, Ph.D. Utah; R. A. Popp, Ph.D. Michigan; R. J. Preston, Ph.D. Reading (England); J. D. Regan, Ph.D. Hawaii; C. R. Richmond, Ph.D. New Mexico; L. B. Russell, Ph.D. Chicago; G. A. Segal, Ph.D. Louisiana State; P. B. Selby, Ph.D. Tennessee; J. K. Selkirk, Ph.D. Syracuse; L. A. Severson, Ph.D. Tennessee; F. L. Snyder, Ph.D. North Dakota; A. Solomon, M.D. Duke; A. L. Stevens, Ph.D. West Virginia; P. A. Swenson, Ph.D. Stanford; R. L. Tyndall, Ph.D. Pennsylvania State; R. L. Ulrich, Ph.D. Rochester; V. R. Uppuluri, Ph.D. Indiana; L. C. Waters, Ph.D. Georgia; C. H. Wei, Ph.D. Wisconsin; H. Witschi, M.D. Berne (Switzerland); W. K. Yang, M.D. Taiwan, Ph.D. Tulane.

The University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, located within the Biology Division of Oak Ridge National Laboratory, offers programs leading to the Master of Science and the Doctor of Philosophy. The National Laboratory is a well-known center for 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-to-student ratio, is based on intensive graduate courses supplemented by tutorial instruction, participation in a wide variety of seminars, and a high 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 biomedical sciences as a whole; and (3) experience and training in a chosen specialty.

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

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 preparation in biology, calculus, physics, and organic and physical chemistry. A course in physical chemistry is offered by the school in order to meet the last requirement. It is recommended that deficiencies in preparation, as identified in the admission process, be eliminated prior to entrance.

The program of study is designed to prepare students for eventual careers in research, teaching, or professional practice, or for future study in specialized graduate schools.
tion 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 Y, Oak Ridge, Tennessee 37831.

THE DOCTORAL PROGRAM

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

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

3. Participation to 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. The requirement for the degree is 24 semester hours of course work 600 is required.

6. A final oral examination on the dissertation.

7. 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 at least one of which should be taken for such a degree within the Oak Ridge National Laboratory, however, a limited number of students from other institutions may be admitted if qualified and as space is available. The requirements for the degree are:

1. Graduate credit or a proficiency in the following core courses: Biochemistry (511); Biophysical Biochemistry (514); Cell Biology (515); and 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 a minimum of 6 semester hours for thesis.

3. For admission to candidacy: Completion of any required prerequisite courses and one semester of graduate course work 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 under admission to candidacy.

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

6. Passing a final examination.

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

507 Physical Chemistry (3) Thermo-dynamics; phase equilibria; chemical equilibria; electrochemical force; surface chemistry; electron transfer; solutions; kinetics; conductance; viscosity; diffusion.


514 Biophysical Biochemistry (3) Chemistry metabolism and biosynthesis of purines, 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 solutions; 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, mutation; cytoplasmic inheritance. Mechanisms of recombination, chromosome structure and replication.

517 Molecular Genetics (2) Molecular biology of genetic processes. Three distinguished outside lecturers present current research on mechanisms of gene regulation; protein synthesis; suppression of nonsense and sense mutation; gene mutants; genetic defects and hereditary diseases. Prereq: 511, 514, and 515.

518 Cell Biology I (3) Structure and composition of major nuclei and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques; meiosis and mitosis; cell cycle; chromosome structure; nucleic acid metabolism; nucleoli and ribosome biogenesis; survey of specialized cells. Structure of genetic transcription and translation in bacteria. Coreq: 511.

519 Cell Biology II (3) Comparative biochemical approach to cell structure and function. Membrane systems and metabolism; development and function of mitochondrion, chloroplasts, peroxisomes and other organelles as related to metabolism and regulation; transport phenomena; cell cycle; cell products; interaction of cells; function of tissues and organs. Prereq: 511, 518.

525 Computing for the Life Sciences (3) Interactive computing. Mini- and micro-computing environments; Basic, Fortran, and/or Pascal languages; application of statistics, graphics, text manipulation, and computer communications.

531-32-33 Biomedical Sciences Laboratory (3,3,3) Approaches and techniques 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) Current and future research developments: protein synthesis, protein structure and enzyme mechanisms; cryobiology, and special topics. Either as tutorial or literature survey requiring substantial student preparation. May be repeated.


561-52-53 Advanced Topics in Biomedical Sciences (3,3,3) Current and future research developments: protein synthesis, protein structure and enzyme mechanisms; cryobiology, and special topics. Either as tutorial or literature survey requiring substantial student preparation. May be repeated.


574 Statistics for Biologists (2) Application and interpretation of statistical methods in data analysis. Random variation; normal, binomial, and Poisson distribution; statistical presentation of data; estimating means and variance; confidence intervals; tests of significance for comparing means; the analysis of variance, contingency tables; Chi-square tests; correlation and association; linear regression. Prereq: Statistics 201 or consent of instructor.

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

622 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by product, substrate and dead-end intermediates; action of allosteric enzymes, types of feedback regulation; role of sub-units in enzyme regulation; multifunctional enzymes. Prereq: 511, 514.

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


628 Molecular Genetics of Carcinogenesis (2) DNA and RNA tumor viruses, oncogenes, growth factors, and their potential role in induction of cancers.


641 Techniques in Cell Biology (3) Basic concepts of cell biology techniques, their application to specific research problems, kind of data yield, and cautions in data interpretation. Laboratory demonstrations may be arranged where appropriate. Prereq: 511, 514, 518, 519.

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

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


Botany (College of Liberal Arts)

MAJOR DEGREES

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

Professors: J. D. Caponetti, Ph.D. Harvard; E. E. Clegsb, Ph.D. Duke; H. R. DeSelm, Ph.D. Ohio State; A. M. Evans, Ph.D. Michigan; W. R. Herndon (Alumni Distinguished Service Professor), Ph.D. Vanderbilt; L. G. Hickok, Ph.D. Massachusetts; R. W. Holton, Ph.D. Michigan; K. W. Hughes, Ph.D. Utah; L. W. Jones, Ph.D. Texas; J. F. McCormick, Ph.D. Emory; F. H. Norris (Emeritus), Ph.D.
Ohio State; R. H. Petersen (Alumni Distinguished Service Professor), Ph.D. Columbia; A. J. Sharp (Emeritus) (Alumni Distinguished Service Professor), Ph.D. Ohio State; H. H. Shugart, Ph.D. Georgia; P. L. Wale, Ph.D. Texas.

Associate Professors:
- C. C. Amundsen, Ph.D. Colorado
- A. S. Heilman, Ph.D. Ohio State; R. R. Henke, Ph.D. Miami (Ohio); B. Mullin, Ph.D. North Carolina State; E. E. Schilling, Ph.D. Indiana;
- O. J. Schwarz, Ph.D. North Carolina State;

Assistant Professor:
- B. E. Wofford (Curator), Ph.D. Tennessee.

The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, botany, botanical genetics, lichenology, morphology, mycology, plant ecology, plant physiology, plant pathology, and taxononomy.

Admission Requirements

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

1. Bachelor's degree: a B.A. or B.S. from an accredited college or university with a cumulative grade point average of 2.5 or better (on a 4.0 scale), with evidence of ability to do work of graduate quality.
2. General botany or general biology: 8 semester hours.
3. Advanced botany or closely allied biological sciences: 12 semester hours.
4. Physical sciences: general inorganic chemistry: 8 semester hours; organic chemistry: Physics highly recommended.
5. College mathematics: 6 semester hours including 1 term of calculus.

Evidence of a broad undergraduate background, an ability to do work of graduate quality, and an interest in the study of plant science are considered to be much more important than the particular courses taken as an undergraduate. Accordingly, students lacking 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 normal route taken by botany students for the M.S. In accordance with the emphasis of the University and the department on research, it involves writing and defending a thesis to describe the results of a completed research project of original work. It is important that the entering student promptly identify a major professor and a suitable research project. (It may be either a terminal degree or a preliminary step to studying for a Ph.D. degree).

1. Satisfactory preparation of a written formulation and an oral defense to the student's committee of a research proposal suitable for a thesis. This must be completed before enrollment in Botany 500.
2. Successful completion of 30 hours of graduate credit, at least two-thirds of which must be at the 500 level or higher.
3. Demonstrated reading proficiency in one modern foreign language in the use of computers for data analysis. Proficiency in a foreign language may be demonstrated by satisfactory performance on an examination in one modern foreign language (see Graduate Coordinator) or an A or B in French 302 or German 332 (can also be applied to the doctoral program). Proficiency in computer use may be demonstrated by satisfactory completion with a grade of A or B of the following computer science courses or their equivalent: C.S. 101 or 102, 112, and 403 or Stat. 261.
4. Satisfactory completion of two hours at the 600 level.
6. Presentation of a 30 minute departmental seminar.
7. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.

Non-Thesis Option

1. Satisfactory completion of 34 semester hours of approved graduate courses, of which 30 semester hours must be in botany including Botany 503. At least two-thirds of the hours must be at the 500 level or higher.
2. Satisfactory completion of two hours at the 600 level.
3. Educational service in the form of teaching and/or ancillary services; consult major professor and department head.
4. Satisfactory performance on a final written examination on all work offered for the degree. The student's faculty 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 work with the student's area of concentration. Although there is no formal program of course work, 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 preliminary 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 set as additional foreign languages or an additional oral preliminary examination may be required by the student's faculty committee.
506 Phyiology (4) Comparative study of major algal phyla, both freshwater and marine: morphological, developmental, ecological, taxonomic and phylogenetic aspects. Field and laboratory studies, identification, classification. 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) photomacro- and photomicrography, 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.

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

516 Bicosystematics (3) Major experimental methods in systematics and application to specific types of systematic problems. Cytotaxonomy, numerical taxon- omy, chemotaxonomy and cladistics.


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

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

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

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

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

551-52 Systems Ecology I, II (2, 2) Nature of ecological systems. System state and change of state. Elementary network conceptions of ecosystem. Prereq: 431 or 573. 552—Flows of energy and materials in ecosystems. The development of computer models of ecosystem interaction during mitotic and meiotic divisions in relation to structural changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and somatic chromosomal changes from plants and animals. Prereq: 310 and at least 6 additional hrs in biological sciences. (Same as Forestry 581.) Sp,A

552 Methods and Instrumentation in Laboratory Investi- gation (1) Project experience and theoretical background in various research methods, ion exchange resins, adsorption spectrometry, disc electrophora- sis, polargraphy, zonal and ultra centrifugation, gas chromatography, automatic analyzers, microscopy, culture methods, use and detection of radioisotopes. Prereq: Chemistry 350, 360; Physics 121, 122. May be repeated. Maximum 5 hrs. S/NC only.


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

560 Developmental Plant Morphology (3) Developmental morphology of plants from vegetative and reproduc- tive organography, and of organ determination and differentiation. Prereq: 310, 320 or 412 and 521 or 521 or consent of instructor. 2 hrs and 1 lab. F, A

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

560-07 Advanced Topics in Botanical Sciences (1- 1, 3-3) Experimental botanical science: nomencla- ture, morphology and systematic of vascular plants, cryptogramic botany, cytology and cell biology, genet- ics, plant physiology, phylochronology and ecology. May be repeated. Maximum 12 hrs.

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

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

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

**Broadcasting**

(College of Communications)

**MAJOR DEGREE**

Norman R. Swan, Head

Professors:

D. W. Holt, Ph.D. Northwestern;

H. H. Howard, Ph.D. Ohio; N. R. Swan, Ph.D. Missouri.

Associate Professor:

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

Assistants:

G. C. Johnson, Ph.D. Southern Illinois;

D. Ziegler, Ph.D. Southern Illinois.

Adjunct Professor:

Lindsey Nelson, B.A. Tennessee.

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

**410 Television News** (3) Writing, reporting, perform- ing, and producing news for television. Experience as reporter/producers for television news program. Elec- tronic news gathering equipment and techniques, video editing. Prereq: 310. 1 hrs and 4 labs. E

420 Radio-TV Sales and Promotion (3) Problems and practices of television, radio, and cable and sales promotion. Case studies in sales, sales management, pricing, rate cards, use of rating, and sales presenta- tions. Effective station promotion techniques. Prereq: 320. F

430 Producing for Television (3) Principles of televi- sion studio and field production, both technical and creative. Writing, producing, shooting, and editing video stories and programs, on-camera, narrators, and editing system. Prereq: 330. E


490 Radio & Television Management (3) Business policies and practices of broadcast operations, depart- mental function, cost and income analysis, leadership styles and techniques, mid-level management. Cap- ston course to be taken in student's last semester. Prereq: 275, 310, 320, 330. E

550 Radio & Television Law and Regulations (3) Legal problems faced by broadcast managers. Philosophy of regulatory policy formation. Efforts at self-regula- tion. Sociopolitical restraints, effects of laws and regulations, and public pressure on stations, net- works, cable and new technologies. Unique situation of broadcasting among media in terms of regulations. Prereq: Consent of instructor or admission to pro- gram. F

570 Radio & Television Research (3) Various techniques used by stations and consultants in broadcast research. Applied audience research. Deciding which method to use, interpreting results, and applying research to management decision making. Prereq: Communications 512 or 612, or consent of instructor. Sp

580 Seminar in Radio & Television (3) Salient issues in broadcasting. Reading assignments, television, educational and public broadcasting, broad- casting and society. Prereq: Consent of instructor or admission to program. F


597 Independent Study (2) Prereq: Consent of instruc- tor. 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 man- agement with non-university professional organization. Educational experience beyond that available at uni- versity. Final term paper. No retroactive credit for previous work experience. Prereq: Senior or gradu- ate standing, completion of at least 15 hrs of broadcasting courses, GPA 3.0 or better, and consent of depart- ment head.

**Business Administration**

(College of Business Administration)

**MAJOR DEGREES**

Business Administration........ MBA, Ph.D.
THE MBA PROGRAM

The MBA program is designed for students with undergraduate degrees in the social and natural sciences, the humanities, and professional fields such as engineering, business, agriculture, and architecture. For full-time students, the MBA program is a two-year, lock-step program with students beginning in the fall of each year and graduating in the spring, two years hence. During the summer between the first and second year, students must complete an internship with a company using those skills acquired during the first year of the MBA program. The complete MBA program with a concentration in management or new venture analysis and entrepreneurship is offered for part-time evening students. The part-time program has the same admissions requirements, curriculum (except for the summer internship, which is not required of part-time students), and faculty as the full-time program. Part-time students enter in the fall semester and take approximately 6 years to complete the program. Part-time students are required to successfully complete six hours of graduate credit per semester.

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

Application and Admission

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

To obtain application materials, write or call:

Associate Dean for Graduate Business Programs
Suite 527, Stokely Management Center
College of Business Administration
The University of Tennessee
Nashville, TN 37996-0550
Telephone: (615) 974-5033

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 recommendation forms, and the Graduate Management Admission Test (GMAT) score report. The first items should reach The Graduate School ten days before the MBA application deadline to allow for processing. Additional information is required by The Graduate School for international students (see page 14).

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

Prerequisites

Upon matriculation, the student must have received a Bachelor's degree from a regionally accredited institution. College-level mathematics through at least one course in calculus is one of two prerequisite requirements for entry into the program. Students whose undergraduate training does not include calculus should arrange to take it at UTK or at another accredited institution prior to the fall semester of entry into the program. The other prerequisite is that the student possess basic operating skills on a microcomputer. An intensive one-week summer workshop is offered for candidates not having the required computer skills. Those obtaining the management science or statistics concentration must have completed two years of college-level calculus.

MBA Core

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

Third semester: Economics 503, Business Administration 506.

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

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

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

Controllership

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

Available to residents of West Virginia under terms of the Academic Common Market. (See College of Business Administration.)

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

Transfer Credits

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

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

The maximum number of hours that may be transferred is 6 semester hours. Transfer credit will be considered upon formal petition to the Associate Dean for Graduate Business Programs.

Other Requirements

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

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

BUSINESS ADMINISTRATION CONCENTRATION

For complete listing of MBA program requirements, see above.

MBA Concentration

New Venture Analysis and Entrepreneurship: This MBA concentration has been designated a Center of Excellence by the Tennessee Higher Education Commission. The concentration is comprised of three specific 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 (finance, management, etc.) to achieve a dual concentration.

Minimum Course Requirements for MBA
Concentration: Finance 551, Management 551, and Marketing 550. These course descriptions are listed for reference under their fields of instruction.

DUAL J.D.-MBA PROGRAM

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

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

Admissions

Applicants for the J.D.-M.B.A. program must make separate applications to each college, and be competitively and independently accepted by the College of Law and the College of Business Administration for the M.B.A. degree, and by the Dual Program Committee.

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies be started prior to entry into the last 28 semester hours of J.D. course work and prior to entry into the second year of the MBA program. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee.

Students who have been accepted by both colleges may apply for approval to pursue the dual program anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program studies be started prior to entry into the last 28 semester hours of J.D. course work and prior to entry into the second year of the MBA program. Students interested in entering the dual degree program should submit a letter of application to the Dual Program Committee.

Curriculum

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

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

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

Awarding of Grades

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

Approved Dual Credit

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

The Ph.D. in Business Administration

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.

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 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. If you are interested in applying to the Ph.D. program under these circumstances, contact the Associate Dean for Graduate Business Programs for consideration of the application.

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 course work, writing, and research. The third year usually focuses on completion of the dissertation research and writing. It is emphasized that the Ph.D. program of study is structured for full-time students only. Upon acceptance of a student by a particular departmental faculty, the student is expected to remain in residence until the dissertation has been completed and all requirements are met for completion of the Ph.D.

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

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

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

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

More detailed information concerning 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 Graduate Business Programs by the end of the first semester of course work 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 course work 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 course work, in the following areas:
   - Accounting
   - Behavioral Science
   - Business Policy
   - Calculus
   - Computer Science
   - Economics
   - Finance
   - Legal Environment
   - Management
   - Marketing
   - Statistics

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

3. Basic Core: Economics 510 (or approved substitute) is required, except that Management 567 (or equivalent) may be substituted with prior approval.
4. Research Tools: A minimum of 9 semester hours of graduate research methods is required. 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 stay abreast of 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 course work in the concentration area must be completed. At least 6 semester hours of statistics courses beyond Statistics 531 are required. The remaining 3 semester hours may be completed in additional statistics courses or in other areas such as research methodology, management science, computer science, econometrics, and psychometrics.
6. A minimum of 9 semester hours of course work 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 area listed above, economics, statistics, or a related area in another school or college of the University.

Comprehensive Examinations

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

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

Doctoral Committee

A doctoral student is advised to give serious attention early in the program to the composition of his/her doctoral committee. In accordance with Graduate 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 course work, successful completion of comprehensive examinations, and acceptance of a research proposal for the dissertation by the student's doctoral committee.

Application for 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). Graduation courses accepted from other institutions must be included. Under "Other Requirements," the date of acceptance of the research proposal by the doctoral committee should be indicated. The application must be approved by the student's doctoral committee and the Associate Dean for Graduate Business Programs before submission to The Graduate School.

Dissertation

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

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

501-03 Integrative Management, II (1,1) Introductory managerial policy and strategy for MBAs only. Use of tools of analysis, data, information, design, and remediation to identify, solve, and correct problems in and of organizations.

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

509 Managerial Policy and Strategy (3) Strategy and policy that affect character and success of total enterprise. Capstone course integrating all functional areas in formulation and implementation of strategy that energizes organization to reach objectives. Prereq: MBA core.

599 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

(Majors in Engineering)

MAJOR

DEGREES

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

Joseph J. Perona, Head

Professors:

D. C. Bogue, Ph.D. Delaware; E. S. Clark, Ph.D. California (Berkeley); L. W. Crawford (UTSB), Ph.D. Cincinnati; D. C. Culberson (Emeritus), Ph.D. Texas; J. F. Fellers, Ph.D. Akron; G. C. Frazier, Jr., D.Eng. Johns Hopkins; J. M. Holmes (Emeritus), Ph.D. Tennessee; H. W. Hsu, Ph.D. Wisconsin; H. F. Johnson (Emeritus), Ph.D. Yale; C. F. Moore, Ph.D. Louisiana State; J. J. Perona, Ph.D. Northwestern, P.E.; J. W. Prados (Medical Doctorate for Academic Affairs), Ph.D. Tennessee; C. D. Scott (Adjunct), Ph.D. Tennessee; C. O. Thomas, Ph.D. Tennessee; J. S. Watson (Part-Time), Ph.D. Tennessee.

Associate Professors:

P. R. Bienkowski, Ph.D. Purdue; D. D. Burns, Ph.D. Houston; C. H. Byers (Adjunct), Ph.D. California (Berkeley); R. M. Counce, Ph.D. Tennessee; T. L. Donaldson (Adjunct), Ph.D. Pennsylvania; A. C. Sheth (UTSB), Ph.D. Northwestern.

Assistant Professor:

F. E. Weber, Ph.D. Minnesota; T. W. Wang, Ph.D. M.I.T.

Lecturers:

D. W. Lane (Adjunct), Ph.D. Tennessee.

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

THE MASTER'S PROGRAM

The standard Master's program includes a thesis and leads to the Master of Science. Minimum departmental requirements are as follows:
1. Students must register for ChE 501 every semester it is offered.

2. A final oral examination covering the thesis, related fields and graduate course work.

3. Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience at the baccalaureate degree; at least five years of industry experience in chemical engineering; and evidence of academic preparation that would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:

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

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

   3. A written comprehensive examination covering 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 independent research to the satisfaction of the department. The Master's thesis may be offered as research to the satisfaction of the department.

The requirements for completion of the doctoral 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, usually given in two parts, and covering such topics as chemical engineering operations and processes, thermodynamics, technology, and other related fields.

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

5. Reading ability, by means of a written examination, in one foreign language of technical or commercial significance. Language must be selected from the following list, which is not intended to be comprehensive.

6. Students must register for ChE 501 every semester it is offered.

7. A final oral examination covering the thesis, related fields and graduate course work.

8. Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience at the baccalaureate degree; at least five years of industry experience in chemical engineering; and evidence of academic preparation that would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:

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

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

   3. A written comprehensive examination covering 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 independent research to the satisfaction of the department. The Master's thesis may be offered as research to the satisfaction of the department.

The requirements for completion of the doctoral 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, usually given in two parts, and covering such topics as chemical engineering operations and processes, thermodynamics, technology, and other related fields.

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

5. Reading ability, by means of a written examination, in one foreign language of technical or commercial significance. Language must be selected from the following list, which is not intended to be comprehensive.

6. Students must register for ChE 501 every semester it is offered.

7. A final oral examination covering the thesis, related fields and graduate course work.

8. Under certain conditions, a candidate may apply for a non-thesis program. To be eligible, a candidate must show evidence of significant professional experience at the baccalaureate degree; at least five years of industry experience in chemical engineering; and evidence of academic preparation that would be examples of such evidence. The departmental faculty will consider each application individually. Upon acceptance, the requirements for completion of the non-thesis option are as follows:

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

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

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

(College of Liberal Arts)

DEGREES

Chemistry M.S., Ph.D.

MAJOR

Chemistry

Gleb Mamantov, Head

Professors:
- J. E. Bloor, Ph.D. Manchester; N. S. Bowman (Emeritus), Ph.D. Princeton; C. A. Buehler (Emeritus) (Alumni Distinguished Service Professor)
- Ph.D. Ohio State; W. E. Bull, Ph.D. Illinois; J. C. Chambers, Ph.D. Kansas; R. N. Compton, Ph.D. Tennessee; J. A. Dean (Emeritus), Ph.D. Michigan; J. F. Eastham, Ph.D. California (Berkeley); W. H. Fletcher (Emeritus), Ph.D. Minnesota; G. Guiochon (Distinguished Scientist), Ph.D. Ecole Polytechnic and Paris VI; G. W. Kabalka, Ph.D. Purdue; D. C. Kleinfelter, Ph.D. Princeton; M. H. Lietzke, Ph.D. Wisconsin; R. M. Magid, Ph.D. Yale; G. Mamantov, Ph.D. Louisiana State; R. M. Pagni, Ph.D. Wisconsin; J. R. Peterson, Ph.D. California (Berkeley); H. H. Ross, Ph.D. Wayne State; G. K. Schweitzer, Ph.D. Illinois; D. A. Shirley (Emeritus), Ph.D. Iowa State; W. T. Smith (Emeritus), Ph.D. Ohio State; W. A. Van Hook, Ph.D. Johns Hopkins; E. L. Wehry, Ph.D. Purdue; T. F. Williams, Ph.D. London; J. J. Wootton (Emeritus), Ph.D. North Carolina.

Associate Professors:
- J. L. Adcock, Ph.D. Texas; J. E. Batmert, Ph.D. Northwestern; K. D. Cook, Ph.D. Wisconsin; F. A. Grimm, Ph.D. Cornell; J. L. Kowalewski, Ph.D. Yale; C. A. Lane, Ph.D. California (Berkeley); L. J. Magid, Ph.D. Tennessee; F. M. Schell, Ph.D. Indiana; M. J. Sapanik, Ph.D. Iowa State; C. Woods, Ph.D. North Carolina State.

Assistant Professors:
- S. D. Alexandratos, Ph.D. California (Berkeley); C. E. Barnes, Ph.D. Stanford; C. S. Feigeier, Ph. D. Colorado; J. H. Shibata, Ph.D. Washington.

Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite two years of chemistry including quantitative analysis.

THE MASTER'S PROGRAM

The department offers concentrations in six areas for the M.S.: analytical chemistry, environmental chemistry, inorganic chemistry, organic chemistry, polymer chemistry, and physical chemistry. The requirements for the M.S. in Chemistry consist of the satisfactory completion of:

1. Research and a thesis to give a minimum of 6 hours of graduate credit in Chemistry 500.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar. (No more than 2 hours may be applied to the course requirements.)
3. Prescribed remedial courses based on performance on entrance examinations.
4. Sufficient graduate coursework in chemistry (at the 400 level or above) and/or a related field to make an overall total of 30 hours, including one of the following sequences: 510-11-12, 530-31-32, 550-51-52. At least 14 hours of this graduate course work 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, and theoretical chemistry.

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

1. Research and a dissertation to give at least 24 hours of graduate credit in Chemistry 600. Registration must be continuous from the beginning of research.
2. Participation in seminar (Chemistry 501) during the entire period of graduate study, including the presentation of at least one seminar.
3. Prescribed remedial courses based on performance on entrance examinations.
4. Completion of the comprehensive examination and defense of an original research proposal to give 2 hours of credit in Chemistry 601.
5. Demonstration of a reading knowledge of French, German, Russian, or an alternative approved by the Chemistry faculty.
6. Eighteen additional hours in courses at the 500 level or above including at least one course above 601 and one of the following sequences: 510-11-12, 530-31-32, 550-51-52-53-54, 570-71-72-73, and 590-94-95.
7. A final oral examination.

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

430 Advanced Inorganic Chemistry (3) Atomic and molecular structure, bonding theories, descriptive chemistry of elements, kinetic and mechanism of inorganic reactions, applications of modern techniques for characterization, coordination and organometallic chemistry. Prereq: 250, Prereq or coreq: 380 or 381. Sp

431 Radioactivity and Its Application (2) Radioactive emissions 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


470 Advanced Physical Chemistry (3) Chemical dynamics, statistical thermodynamics, quantum mechanics of atomic and molecular systems, crystal structure and solid state. Prereq: 380 or 381. Sp

500 Thesis (1-15) F,P

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when students need 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 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. F

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

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

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

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

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

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

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

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

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

553 Spectroscopic Characterization of Organic Compounds (2) Organic structure elucidation using spectroscopic methods; nuclear magnetic resonance, infrared, ultraviolet and mass spectrometry. Prereq: 360 or equivalent. Sp

554 Advanced Organic Chemistry Laboratory (1) Synthesis of organic compounds illustrating modern techniques. Prereq: 360 or equivalent. Sp

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

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

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

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

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

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


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

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

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

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

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

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


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

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

**Child and Family Studies**

*(College of Human Ecology)*

**MAJORS**

**DEGREES**

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

Greer L. Fox, Head


Associate Professors: J. H. McInnis, Ph.D Florida State; G. Peterson, Ph.D. Brigham Young; G. Twardosz, Ph.D. Kansas.

Assistant Professors: J. Allen, Ph.D. Purdue; B. Barber, Ph.D. Brigham Young; L. Blinn, Ph.D. Ohio State; G. Buehler, Ph.D. Minnesota; C. Catron, Ed.D. Vanderbilt; R. Hazlatches, Ed.D. Ohio State; G. Pettit, Ph.D. Indiana University; D. Tegano, Ph.D. Virginia Tech; K. Weddle, Ph.D. Tennessee.

The Department of Child and Family Studies encompasses two primary concentrations: child development and family studies. Integration of these areas creates a unique perspective for the study of individuals and families. Each graduate student's program of study is carefully planned in conjunction with a faculty committee to establish a program consistent with individual goals. All programs are characterized by a broad array of course work, 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**

Admission to the program is contingent upon faculty evaluation of GRE scores, undergraduate/graduate GPA, writing, and work experience. Prerequisites for admission to the Master's or doctoral program are 9 semester hours of either upper division undergraduate or graduate social science.

**THE MASTER'S PROGRAM**

An individual program of study may be designed in consultation with his or her major professor and committee. The program provides for a concentration in either child development or family studies. Specializations in the child development concentration consist of early childhood education, early childhood special education, early childhood administration, and child development. Specializations in the family studies concentration consist of family life intervention and family science. Thesis and non-thesis options are available in both concentrations.

All students in the child development concentration must enroll in CFS 510, 511, 533, and 571. At least 6 hours in a cognate area outside the department must be completed. Thesis students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of specialization, 6 hours of thesis credit and an oral comprehensive examination. Non-thesis students are required to take the following: 3 hours of 500-level research methods, 3 hours of 500-level statistics, 6 hours of CFS courses in the area of specialization; 6 hours of thesis credit and an oral comprehensive examination. Thesis 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; the 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 18 credits in child and family studies required foundation courses: 510, 511, 550, 551, 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 those credits in a more specialized area than a sequence of survey courses;
5. Minimum 3 credits of specialized research methods;
563 Family Life Education Programs (3) Planning, implementing, and evaluating programs in marital, parent-child, and family relationships, and parenthood education. Prereq: Consent of instructor. (Same as Home Economics Education 563.) F,A

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

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

566 Approaches to Family Intervention and Counseling (3) Various theoretical approaches for family intervention and counseling. Structural, strategic, experiential and social learning schools of practice. Effects of intervention from perspective of their impact on family functioning and counseling. Prereq: 562. (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/NC only. E

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

581 Directed Study in Human Development or Family Studies (3) Individual learning experiences in specific topics in child development and early childhood education, major family studies. Prereq: 6 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 practical techniques related to measurement of development and learning in young children. F,A

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

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

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

631 Adolescent Development in Families (3) Normative and nonnormative adolescent development: physical, cognitive, moral, social, family, peers and personality. Prereq: 510 or equivalent or consent of instructor. F,A

632 Family Communication and Conflict Management (3) Human communication and conflict management within family context. Theoretical perspectives for familial processes, adjustment, decision making, and coping. Prereq: 550 or equivalent or consent of instructor. Sp,A
Thesis Option: A minimum of 30 semester hours, including at least 6 hours of thesis, is required.

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

Environmental Engineering

For a Master of Science with a major in Environmental Engineering, normally a Bachelor's degree in a field of engineering is required. For a student who does not have an engineering background, the following minimum prerequisite courses will be required: BE 121, 131; ESM 321; CE 261, 390, 395, 380; Math 141, 142, 231, 241. In general, these must be completed before courses for graduate credit can be taken.

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

Thesis Option: The student must present a minimum of 50 hours of approved graduate courses. The major shall include a minimum of 6 semester hours of thesis and 12 semester hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

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

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

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

MASTER OF ENGINEERING PROGRAM

A graduate program in civil engineering leading to the degree of Master of Engineering is available to qualified graduates of EAC/A.B.E.T. accredited undergraduate curricula in civil engineering or environmental engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content. The thesis and non-thesis option noted under the Master of Science program is available to this program.

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

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

5. Upon completion of at least one-half of all course work, 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.

Civil Engineering

404 Computer Applications in Civil Engineering (3) Computer solution of civil engineering problems involving roots of equations, simultaneous linear equations, curve fitting, numerical integration, and ordinary differential equations. Student written programs. Prerequisite: Basic Engineering 201 and Mathematics 241.

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

410 Land Surveying (3) Procedures of locating properties; evaluating evidence; procedures to describe property, to create land division, and to prepare plots; laws of land surveying. Prerequisite: 210.

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. Prerequisite: 321. 2 hrs and 1 lab.

451 Highway Engineering (3) Design, construction, operation, and maintenance of highway facilities; application of various engineering principles and techniques to process of planning, locating and design of highway facilities; both geometric and pavement design. Prerequisite: 210, 251, 352.

452 Traffic Engineering (3) Characteristics of driver, vehicle, and roadway and their interrelationship; traffic studies: including traffic concentration and control, lighting, capacity analysis, roadway safety analysis and design. Prerequisite: 210, 251, 352.

453 Airport/Railroad Planning and Design (3) Airport master planning and railroad engineering. Runway configuration, airfield capacity, geometrics and terminal layout and design. Railroad capacity, geometrics and system layout and design. Prerequisite: 210, 251, 352.

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

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

490 Water Resources Project Design (3) Coherent development of multipurpose reservoir and dam project, data acquisition, spillway and outlet works design, earth and gravity dam stability analyses; gravity and earth dam safety concepts, dam break analyses. Prerequisite: 390, 395.

494 Urban Drainage Engineering (3) Design and management of stormwater conveyance and control structures. Application of hydraulic and hydraulic principles to design of drainage systems for urban, strip mining, and highway development; design of street structures, ditches, culverts, and detention/retention basins; application of commonly-used computer runoff models; evaluation of land-use and development implications and water quality. Prerequisite: 390, 395.

495 Water Resources Development and Management (3) Principles of water resources project development and planning. Management and institutional framework: water law, evaluation of online databases, selection and design of water resources development alternatives; multi-objective planning, principles of engineering economics, benefit-cost analysis, cost allocation methods; environmental impact assessment procedures; institutional development, cost and benefit analysis methods. Prerequisites: 390 and 395.

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

502 Registration for Use of Facilities (3-15) Required when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated 2 hrs and 1 lab.

503 Principles of Rock Mechanics (3) Properties of rock materials and masses. Analysis of stress and strain; friction; time-dependent effects. Applications in the stability of tunnels, mining, and foundation engineering. Prerequisite: 330 or consent of instructor.

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

578 Soil Mechanics in Geotechnical Engineering (3) Applications of advanced 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. Prerequisite: 335.

581 Construction Management I (3) Management and organization of heavy and building construction projects. Prerequisite: 540.

582 Construction Management II (3) Management of construction projects. Prerequisites: 540 and 541.

594 Construction Estimating (3) Project costs, estimating and takeoff techniques, market cost conditions, and feasibility of design to cost. Prerequisite: 540 or consent of instructor.

595 Rock Excavation (3) Characteristics of explosives and blasting initiating systems. Design of rock blasting, tunneling and trenching. Prerequisite: 540.

551 Traffic Engineering-Characteristics (3) Vehicle-roadway system; traffic flow modeling; elements of traffic control; highway safety. Prerequisite: 540.
552 Traffic Engineering-Operations (3) Signs, signals, lane drop operations; control of flow; time of signal phasing; one-way reversible flow; system operations; identification and correction of high-accident locations and system deficiencies. Prereq: 551 or 452.

553 Geometric Design and Layout of Roadways and Community Facilities (3) Functional and geometric design and rural and urban roads of all classes; subdivision layout; configuration of urban roads of all classes; techniques for access control; freeway interchange and street intersections; and parking. Prereq: 452 or consent of instructor.

554 Urban Transportation Planning (3) Transportation problems in urban areas; systematic planning for identifying existing and future problems; travel surveys and demand models; evaluation of alternatives; implementation. (Same as Planning 537.)

555 Public Transit Planning (3) Characteristics of transit modes—conventional and paratransit; operational design of transit services: route planning and scheduling; cost analysis; mode choice models; performance evaluation; transit survey; organization and financing. Prereq: 554 or graduate standing.

556 Traffic Accident Reconstruction (3) Data collection and analysis as basis for accident prevention on control programs; 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, 554.

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


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

563 Statically Indeterminate Structures (3) Reflection of forces on members; moment distribution and other displacement methods; secondary stresses. Prereq: 361.

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

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

566 Environmental Engineering (3) Analysis and design and rating of structures using engineering standards as design criteria. Stress testing, fatigue testing. Prereq: 566.

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

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

574 Behavior of Reinforced Concrete Members (3) Moment-curvature theory; influence lines; analysis for reinforced concrete beams; combined bending and axial load; shear and torsion; relation between research results and specifications for design. Prereq: 472.

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

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

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

590 Special Problems in Civil Engineering (1-6) Enrollment limited to civil engineering students in nonthesis 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: only. E

637 Numerical Models for Geologic Materials (3) Numerical models to represent the stress/strain/volume relationships for soils, rock, and concrete; nonlinear elastic models; classical plasticity models; critical state and capping plasticity models; multiple surface models; determination of parameters from laboratory tests; numerical implementation. Prereq: 500 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 refraction techniques; effects of earthquakes and vibrating machines on soils and foundations; dynamic and cyclic soil testing and determination of soil parameters. Prereq: 335 and 565 or Engineering Science and Mechanics 431.

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

652 Analysis Techniques for Transportation Systems II (3) Advanced topics of application of mathematical, statistical and computer science techniques in modeling and analysis of transportation systems. Prereq: 651.

656 Advanced Structural Reliability (3) Monte Carlo methods; structural system reliability; random processes; dynamic loads on structures. Prereq: 554.

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

674 Behavior of Reinforced Concrete Beams and Slabs (3) Strain-stiffening effects; statically determinate reinforced concrete beams and frames; limit analysis; behavior, analysis, and design of reinforced concrete slabs; yield-line theory. Finite element solutions, and ACI Code Method. Prereq: 574.

Environmental Engineering

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

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

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

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

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

522 Floodplain and Urban Flood Management (3) River management, regional, and local flood problems; state of the art flood damage reduction techniques: 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 zoning 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 390.


530 Stormwater Modeling (3) Systems approach to stormwater modeling. Hydrologic components, linear and nonlinear systems integrated into mathematical models of watershed response. Review and application of water quality used to determine computer processes. Prereq: Civil Engineering 395.


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, and digital images with application to transportation and facilities planning, construction and operations. Prereq: Consent of instructor.

541 Remote Sensing Data Acquisition and Analysis (3) Active and passive sensors; automated analog and digital data acquisition and analysis; remote sensing 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 applications of biological processes to treatment of wastewater and solid wastes. Prereq: Civil Engineering 380. 2 hrs and 1 lab.

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

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

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

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

571 Design of Air Pollution Control Systems (3) Design and evaluation of systems used to control emission of 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: Consent of instructor.

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

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

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

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

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

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

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


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

691 Special Topics in Environmental Engineering (1-6) Advanced problems of current interest. Prereq: Consent of instructor. May be repeated.
or above. An internship, if needed, is included.

3. Three hour elective from a list provided by the department in area of concentration.

4. Six hours of thesis work (Communications 500), including a thesis seminar.

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

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

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

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

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

**DOCTOR OF PHILOSOPHY PROGRAM**

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

The program is interdisciplinary, consisting of a required core curriculum and recommended courses outside the College in the related social and behavioral sciences. The program is flexible and will accommodate a wide variety of career goals in communications.

New students may be admitted to the program at any time; however, core courses must be completed 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. Above the fiftieth percentile in verbal and quantitative aptitude on the Graduate Record Examination;
3. Endorsement by at least three former teachers or professional colleagues; and
4. A statement of the applicant's goals and reasons for pursuing the doctorate.

Personnel 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 66 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 682.
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).
4. Nine hours of electives*.
5. Twenty-four hours of dissertation.

*Specific courses to be taken are required to fulfill the approval of the student's advising committee.

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

A diagnostic exam must be taken during the second semester after entering the doctoral program. This exam covers Communications 610, 612, 640, 641, and one statistics course.

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 in the College Calendar. Information is available from the Dean's Office, 302 Communications Building, 974-3031.

**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) Applicatons of communications research techniques for management. Gathering and analysis of data for assessing media audiences and message impacts. Prereq: Consent of instructor or admission to program. Sp**

**521 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. Sp**

**593 Seminar Mass in Communications Issues (3) Contemporary communications. Consent of instructor. Maximum 6 hrs. E**

**597 Independent Study (3) Reading, research or projects of special interest. Prereq: Consent of instructor or admission to program. S/NC only. F**

**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: experimental, survey, content analysis, historical and qualitative. 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. Sp**

**622 Quantitative Research (3) Techniques for evaluation of research design and measurement. Survey, content analysis, and experimental techniques. Assessment of reliability and validity. Data analysis, hypothesis testing, and inference strategies. Prereq: 812. 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. Su**

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

**641 Mass Communications Theory II (3) Selected topics in theory. Critical evaluation of mass communication theory, derivation of hypotheses, and advanced theory construction. Prereq: 640. Sp**

**642 Qualitative Research (3) Theory and application of qualitative research methods to social science and communications research requirements. Theoretical considerations underlying symbolic interactionism as translated into research strategies of participant observation, life history interviews, and case studies. Prereq: 612 or consent of instructor. Sp**

**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. F**

**692 Advanced Topics in Communications Theory and Methodology (3) Advanced study of communication issues, theories and methods. May use quantitative, qualitative, historical or legal approaches. May be repeated. Prereqs: 622, 632, 642 or 652 or consent of instructor. Sp**

**Comparative and Experimental Medicine**

*Office of the Provost*

**DEGREES MAJOR**

**Comparative and Experimental Medicine**

M.S., Ph.D.

Hyram Kitchen, Chair
Joint Graduate Coordinating Committee:
J. E. Fuhr; R. A. Griesemer; H. Kitchen; J. E. Lawler; R. L. Michel.

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is a jointly-administered graduate program intended to prepare students for teaching and/or research careers in the health sciences. This program emphasizes the comparative approach to the study of pathology, immunopathology, 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 an 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, Birth Defect Center, Aberrant Metabolism Laboratory, and Hematology and Oncology services.

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

ADMISSION REQUIREMENTS

General Requirements
Admission to the Graduate School of UT will apply. In addition, all applicants will be required to furnish three letters of recommendation from individuals who are familiar with their scholastic or professional records.

Requirements for Admission to the Master of Science Degree Program
Applicants will be required to have a professional degree in one of the medical sciences (M.D., D.D.S., D.V.M.) or a baccalaureate degree with course work including chemistry through organic; mathematics through calculus; one year of physics; and one year of basic biology plus an additional half-year of more advanced study in the field of biology including courses such as biochemistry, mammalian anatomy, histology, cell biology, or others that are appropriate for individuals aspiring to research careers in biomedical science.

Applicants for admission to the Master of Science program whose backgrounds include no formal training in the biomedical field beyond the baccalaureate degree will be required to present evidence of satisfactory performance on the Graduate Record Examination.

Requirements for Admission to the Doctor of Philosophy Program
Applicants will generally be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences.

Selected individuals having baccalaureate degrees with strong backgrounds in the physical and biological sciences may be admitted upon presenting evidence of satisfactory performance on the Graduate Record Examination.

Exceptions to the above requirements may be made at the discretion of the Admissions Committee if the minimal requirements of The Graduate School have been met. Applicants who are admitted to graduate programs but who are lacking in course requirements will be required to correct these deficiencies early in their graduate programs.

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

Computer Science

(College of Liberal Arts)

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

Jesse H. Poore, Head

Professors:
Moonis Ali (UTSI), Ph.D. Aligarh; A. George (Distinguished Scientist), Ph.D. Stanford; R. C. Gonzalez, Ph.D. Florida, (Electrical Engineering); J. H. Poore, Ph.D. Georgia Institute of Technology; G. R. Sherman, Ph.D. Purdue (Director of Computing Center); M. G. Thomason, Ph.D. Duke.

Associate Professors:
R. B. Blake, D.Phil. Oxford (U.K.); J. D. Case, Ph.D. Illinois (Urbana-Champaign); C. P. Pfleeger, Ph.D. Pennsylvania State.

Assistant Professors:
R. S. Blair, Ph.D. Pittsburgh; J. R. B. Cockett, Ph.D. Leeds (U.K.); Seung-Chui Lee (UTSI), Ph.D. Florida State; D. W. Straith, Ph.D. Texas; T. A. Thomas, Ph.D. North Carolina (Chapel Hill); M. Zemanova, Ph.D. Florida State.

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

THE MASTER'S PROGRAM

Thirty semester hours of graduate credit are required, 24 of which must be 500 level or above. 511 and 513 are required unless explicitly waived by the department. Graduate courses outside the department are allowed but must be approved by the Graduate Committee before enrolment.

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

Non-Thesis Option
The student must take course work 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.

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

THE DOCTORAL PROGRAM

Admission Requirements
A student seeking admission to the Ph.D. program is expected to meet the following requirements:
1. The student should have three letters of recommendation sent directly to the department head from individuals capable of assessing the student's potential for advanced work in computer science (for example, college teachers or 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 background requirements for graduate work. See the departmental brochure for details.

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

Admission to Candidacy
Admission to the Ph.D. program does not guarantee admission to candidacy for the degree. Official admission to candidacy is based on the following procedures:
1. The student completes the course work requirements as defined above.
2. The student passes precomprehensive examinations covering three areas determined individually in advance. Each exam is graded as high pass, pass, low pass, or fail. The student must make a high pass in at least one of the areas and no less than low pass in all other exams. These exams may be taken a maximum of two times, separated by no more than one calendar year. In a second attempt, a student does not have to take the area(s) in which a high pass was earned on the first attempt. The Computer Science Graduate Committee administers these exams, which must be passed prior to admission to candidacy and at least two semesters in advance of conferment of the degree. Comprehensive examinations must be taken within five years, and all requirements must be completed within eight years after the time of a student's first enrollment in the doctoral program.
3. The student requests a member of the Computer Science Department's faculty to become the major professor, dissertation director, and chair of the student's commit-
courses in artificial intelligence. Commercial software, techniques, systems. Prereq: 301 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

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

Applications of Database Systems (3) Service course in database systems. Commercial software, systems, techniques. Prereq: 100 or 101 or 102. Not for credit for computer science majors. 3 hr lab required.

Introduction to Artificial Intelligence (3) Basic techniques in artificial intelligence research, gaming, and theorem proving. Prereq: 320. 3 hr lab required.

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

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

Robotics Software (3) Software for robotic control. Prereq: 331 and Mathematics 142. 3 hr lab required.

Functional Languages (3) Functional, applicative approach to object-oriented languages. LISP and SMALLTALK, used for research applications. Prereq. 111, 112 and Mathematics 222. 3 hr lab required.

Computer Graphics (3) Interactive computer graphics. Transformations, perspectives, shading, vector representation. Color, monochrome hardware, tablets and chips, with goal of understanding techniques for designing computer systems for graphics capability. Prereq: 331. 3 hr lab required.

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

Networks and Communications (3) ISO open system interconnection model, protocols, study of several existing wide area networks, local area networks. Prereq: 331 and 360.

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

Computer Systems Hardware Design (3) Computer systems hardware: bus structures, I/O devices, interrupt support, scheduling, priority access, clock, timing budgets, and system consideration. Lab: construction, testing and debugging of either or both microprocessor systems. Computer- commercially available microcomputer component devices. Prereq: 435.

Microprogramming (3) Microprogramming concepts and techniques for control of large and small machines. Bit-slice architecture, sequencers. Prereq.: 331. 3 hr lab required.


Introduction to Database Management Systems (3) File searching and access, organization of data, file indexing, and relational models; relational calculus and algebra, data definition and manipulation languages; implementation and security considerations, performance, integrity, and reliability metrics; intelligent database systems. Prereq: 340 and 311.

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


Pattern Recognition and Analysis (3) Elements of pattern recognition, learning algorithms, decision theory, classification rules. Prereq: 111 and 311. 3 hr lab required.

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

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


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

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


Parallel Computation II (3) Continuation of 465. Prereq: 466.


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

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


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


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

Theory of Information (1-3) P/NP only. E

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

Immigration to Computer Science (5) Advanced programming techniques in high-level language; control of input/output devices; file systems; machine organization and assembly language programming. Prereq: 111 and 112.

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

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

522 Cybernetics (3) Various functions in living systems and their actual or potential realization in computers. Prereq: 511 and 513.

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

535 Computer Architecture (3) Parallel processing control methods, pipelining, vector processors, functional units, memory organization and control, data flow, reduced instruction sets, symbolic processors. Prereq: 511 and 513.


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

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

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

551 Pattern Analysis (3) Decision-theoretic and structural pattern analysis. Deterministic and statistical decision rules, feature extraction and representation; syntactic and semantic methods, relational models. Prereq: 513 and course in probability or statistics.

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

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


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

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

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

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


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

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

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

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

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

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

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

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

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

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

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

Cultural Studies

(College of Liberal Arts)

Mary P. Richards, Director

The College of Liberal Arts offers a series of interdisciplinary undergraduate majors and minors through its Cultural Studies programs. These programs include Afro-American Studies, American Studies, Ancient Mediterranean Civilizations, Asian Studies, Cinema Studies, Comparative Literature, Latin American Studies, Linguistics, Urban Studies, and Women's Studies. Certain courses within these programs are available for graduate credit as listed below. See the Undergraduate Catalog for program descriptions and directors.

Afro-American Studies


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

421 Readings in Islamic Literature (3) Prereq: Mastery of intermediate-level Arabic or consent of instructor. May be repeated. Maximum 6 hrs.

431 Readings in Chinese Literature (3) Prereq: Mastery of intermediate-level Chinese or consent of instructor. May be repeated. Maximum 9 hrs.

451 Readings in Japanese Literature (3) Prereq: Mastery of intermediate-level Japanese or consent of instructor. May be repeated. Maximum 9 hrs.

471 Selected Topics in Asian Studies (3) Content varies. May be repeated. Maximum 6 hrs.

Comparative Literature

401-02 Special Topics in Comparative Literature (1-3) Content varies. May be repeated. Maximum 9 hrs.

Latin American Studies

401 Cultural Plurality and Institutional Changes in Latin America (3) Value systems, behavioral pattern, 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

400 Topics in Linguistics (3) Content varies. May be repeated. Maximum 6 hrs.

411 Linguistic Anthropology (3) (Same as Anthropology 412.)

420 The Development of Historical Linguistics as a Science (3) Scientific understanding of language change, Emergence of Neogrammarian paradigm from 19th-century intellectual trends, Impact of synchronic, 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.)


435 Structure of the German Language (3) (Same as German 435.)

436 History of the German Language (3) (Same as German 436.)

471 Sociolinguistics (3) (Same as English 471 and Sociology 471.)

472 American English (3) (Same as English 472.)

474 Teaching English as a Second or Foreign Language I (3) (Same as English 474)

475 Teaching English as a Second or Foreign Language II (3) (Same as English 475.)

485 Special Topics in Language (3) (Same as English 485.)

559 Problems in Linguistics: Romance Languages (3) (Same as French 559 and Spanish 559.)
Urban Studies

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

400 Topics in Women's Studies (3) Content varies. May be repeated.
422 Women Writers in England (3) (Same as English 422.)
425 Women's Health (3) (Same as Health 425.)
434 Psychology of Gender (3) (Same as Psychology 434.)
456 Rhetoric of the Women's Rights Movement (3) (Same as Speech 456.)
483 Afro-American Women in American Society (3) (Same as Afro-American Studies 483.)

Curriculum and Instruction
(College of Education)

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

Theodore W. Hipple, Head

Professors:
J. E. Alexander, Ed.D. Kentucky

Associate Professors:

Assistant Professors:
R. A. Austin, Ph.D. Florida State;
D. A. Hendricks, Ph.D. Alabama;
A. M. Rutherford, M.A. Virginia.

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 SPECIALIST PROGRAM

For the Master of Science, thesis and non-thesis options are available in the Curriculum and Instruction major with concentration in the following areas: curriculum, elementary education, English education, foreign language education, instructional media and technology, mathematics education, reading education, science education, and social science education. The non-thesis option requires the completion of 33 semester hours of course work. The thesis option requires the completion of 30 semester hours including six hours of Thesis 500.

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, instructional media and technology, mathematics education, science 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, instructional media and technology, mathematics education, science education, social science education. The Doctor of Philosophy with a major in Education includes concentrations and specializations as listed under Education.

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

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
445 Early Childhood Education: Program Development and Teaching in Kindergarten (3) Curriculum planning, classroom organization and management practices for teaching young children; relationship of kindergarten to elementary school. Prereq: Admission to teacher education. E
451 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and thought in our society and others.
460 Teaching Reading and Literature in the Secondary School (3) Teaching basic reading skills and ways of teaching literature. Sp
461 Developing Reading Skills in Content Fields (3) Techniques for teaching reading and study skills in content areas of school program. Extensive assessment of textbooks. Middle school and high school. E
475 Utilization of Instructional Media (3) Basic concepts of communication and instructional development for improving instruction through use of media. (Same as Library and Information Science 475.) E
488 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 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) May be repeated. Maximum 9 hrs. S/NC only. E
504 Studies and Theory in Language Development (3) Studies and theory of language development in children. Prereq: 1 elementary school language arts course or consent of instructor. F
507 Teaching Poetry Grades 7-12 (3) Research and theory in application to teaching of poetry. Design of strategies and materials for teaching and writing and reading of poetry. Review of texts and materials. F
508 Teaching Composition in the Secondary School (3) Techniques for teaching composition. May be repeated. Maximum 6 hrs. S/NC only. E
515 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E
516 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC only. E
517 Seminar (1-3) Curriculum, instructional technology, elementary education, secondary education, or social foundations as related to goals of students' programs. May be repeated. Maximum 6 hrs. S/NC or letter grade. E
518 Educational Specialist Research and Thesis (2) May be repeated. Maximum 4 hrs. P/NP only. E
519 Educational Specialist Research and Thesis (2) P/NP only. E
520 Techniques of Research in Education (3) Study and application.
521 Teaching Social Studies in Elementary and Middle Schools (3) Planning and techniques. Trends in curriculum, development of concepts and generalizations, integration of social sciences. Prereq: Course in teaching of social studies or consent of instructor. Sp
522 Teaching Mathematics in Elementary and Middle Schools (3) Instructional strategies for helping elementary school children learn mathematics. Examination, development and use of materials for creating active learning environment. Prereq: 443 or equivalent or consent of instructor. F, Su
523 Diagnosis and Correction of Children's Difficulties in Learning Mathematics. Prereq: Children's difficulties in learning mathematics and procedures for helping classroom teacher correct difficulties. Prereq: 522 or equivalent or consent of instructor. Sp
525 Strategies, Programs and Materials for Teaching Elementary Social Studies (3) Analysis of new and innovative social studies program materials and techniques. Exploration of current trends in social
526 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. F,Su
527 Elementary School Curriculum (3) Examination, evaluation and application of curriculum designs in elementary school. Trends and issues which affect elementary education. Prereq: Consent of instructor. F,Su
528 Teaching Language Arts Elementary and Middle School (3) Recent trends and current materials and methods in teaching elementary language arts (except reading). Prereq: Course in language arts or consent of instructor. 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. Sp
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 of science instruction in 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 and secondary school reading programs and applications to research and theoretical bases. Prereq: Course in reading education or consent of instructor. Su
534 Seminar in Reading Education (1-6) May be repeated. Maximum 6 hrs. E
535 Curriculum Evaluation and Program Improvement (3) Historical background and importance of educational evaluation in relation to curriculum development. 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 the development of intellectual and cultural factors. Prereq: 500-level course in reading education or consent of instructor. F
537 Diagnosis and Correction of Classroom Reading Problems (3) Procedures, methodologies and materials for diagnosing and correcting classroom reading problems. Prereq: Course in reading education, or equivalent teaching experience, or consent of instructor. Sp,Su
538 Practicum in Diagnosis of Reading Problems (2) Theoretical and practical applications of specific reading diagnostic instruments; testing of elementary and/or secondary school students, preparing case study reports, and conducting parent conferences. Prereq: Course in diagnosis and correction of classroom reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Sp
539 Practicum in Remediation of Reading Problems (2) Application and analysis of teaching methodologies in working with elementary and/or secondary school students on one-to-one or small group basis. Prereq: Consent of instructor. Maximum 4 hrs. Sp
540 Topics in Improvement of Instruction (1-3) Special conferences, workshops, and inservice programs. May be repeated. Maximum 6 hrs. S/JNC only. E
541 The High School Curriculum (3) Identification of problems associated with high school program. Survey of curriculum framework, assessment of trends in programs of local, regional, and national significance. E
542 Development of Educational Thought (3) Historical and philosophical writings of influential educators. Plato, Quintillian, Comenius, Rousseau, Pestalozzi, Froebel, Dewey. Prereq: Graduate status and consent of instructor. F
543 Foundations of Educational Policy (3) Relationship between policy, theory, and practice; educational policies that arise from philosophical and practical considerations relative to human nature, to educational purpose, to content of curriculum and to methods and techniques for conducting educational enterprise. F,Su
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 (3) Procedures and materials for diagnosing and correcting language arts difficulties; analysis of children's work. Prereq: At least one language arts course or consent of instructor. Su
552 Developmental Reading Practicum (2) Diagnosing and teaching children having developmental and corrective reading needs. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 4 hrs. Su
557 The Junior High and Middle School Curriculum (3) Curriculum and instructional design for junior high and middle school. Characteristics of students, curriculum designs, instructional patterns, and organization and structure of junior high and middle schools. Sp,Su
558 Curriculum Planning and Development (3) Foundations and principles of curriculum planning and development. Historical analysis of curriculum theory, principles of planning and development, and classroom applications for improved learning. E
561 Educational Statistics (3) Applications of descriptive and inferential statistics to educational and instructional problems. Use of electronic calculators in educational research. Prereq: One year of college mathematics. Related teaching methodologies. Opportunities for work on special problems. Prereq: Undergraduate course in teaching of mathematics. Su
562 Teaching Enrichment Mathematics in Middle and Junior High Schools (3) Topics to enrich middle and/or junior high mathematics. Geometrical, labora- tory, and problem solving activities. Special attention to metric system. Opportunities for individual projects. Prereq. 581. F,Sp
563 Teaching Mathematics in Senior High Schools and Community Colleges (3) Topics appropriate for high school and community/junior college mathematics curriculum. Special emphasis on related teaching methodology and/or junior high mathematics. Prereq: Undergraduate course in teaching of mathematics. Su
564 Seminar in Early Childhood Education (3) Analysis of research and theory in early childhood education; educational process of young children. Prereq. Consent of instructor. May be repeated. Maximum 6 hrs. Sp,Su
565 Teaching Secondary School Social Studies (3) Strategies, projects, materials, and programs in social studies. Prereq: Undergraduate course in teaching of social studies. F,Su
566 Teaching Probability & Statistics (3) Teaching of probability and statistics in schools, elementary through college. Prereq: Undergraduate course in teaching of social studies. Prereq: 581. F,Su
567 Teaching Foreign Languages in Secondary Schools (3) Advanced instructional techniques and evaluation procedures: materials analysis and preparation; trends, issues, and research in modern foreign languages and Latin. Prereq: Consent of instructor. F
568 Instructional Theory and Design (3) Relationship of curriculum to instruction; examination of instruc- tional and related learning theories, instructional models and teaching styles. E
569 Application of Theory in Early Childhood Education (K-3) (3) Principles and practices from selected theoretical orientations. Impact of early childhood education or consent of instructor. May be repeated. Maximum 6 hrs. F,Su
570 Teacher-Parent-Community Relations (3) Techniques for effective relations between parents and teachers; examination of roles, responsibilities, and functions of parent involvement; volunteer programs: influence of community on educational process. Prereq. Consent of instructor. Sp,Su
571 Advanced Production of Audiovisual Software (3) Hand and mechanical lettering, flat picture mounting, laminating, overhead projection, audio production, TV studio orientation, special effects presentation, and printing techniques. (Same as Library and Information Sciences 569.) Sp,Su
572 Utilization of Educational Television and Radio (3) Television and radio as instructional and training media. Selecting, making and evaluating instructional training video and audio tapes. F
573 Introduction To Data Processing in Curriculum and Instruction (3) Analysis of current activities in educational computing and data processing. Curriculum, instructional, research, and classroom management applications from microcomputers to super computers. Prereq. Consent of instructor. F,Su
574 Curriculum and Instruction/Fields of Instruction 69
589 Field Experience (1-3) Application of curricular and instructional principles, methods, and materials in schools. Prereq: Program prerequisites and consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

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

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

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

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

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

596 Teaching of Natural Science and Environmental Education (3) Strategies, laboratory techniques, assessment, current programs and professional guidelines for middle, junior and senior high schools, and community colleges. Prereq: Consent of instructor. F

597 Teaching Drama Grades 7-13 (3) Strategies and materials for teaching creative dramatics, enacting and writing of plays, reading of scripts. Sp

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

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

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

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

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

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

604 Seminar in Curriculum and Instruction (1) Required 2 courses in curriculum and instruction, E

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

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

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

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

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

625 Seminar in History of Education (3) Selected historical issues in education. Prereq: 2 courses in history or philosophy of education. May be repeated with consent of instructor. Sp

628 Advanced Studies in Elementary School Science (2) Current research in elementary school science as applied to classroom practice. Prereq: Graduate course in science education or equivalent or consent of instructor. May be repeated. Maximum 4 hrs. E

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

640 The Dynamics of Educational Change (3) Interdisciplinary approach to change process in education. Prereq: Consent of instructor. Sp

648 Topics in Sociology of Education (3) May be repeated. Sp

650 Advanced Studies in Early Childhood Education (3) 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

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

671 Advanced Educational Statistics (3) Applications of parametric and non-parametric statistical inference to educational and instructional problems. Use of microcomputers in educational research. Prereq: 561. Sp, Su

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

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

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

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

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 practices of curriculum development and instructional improvement. Prereq: Program prerequisites and consent of instructor. May be repeated. Minimum 9 hrs. S/NC only. E

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

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

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

696 Advanced Studies in Secondary Science and Environmental Education (3) Trends in science and environmental education, materials and methods for research for middle, junior and senior high schools, and community colleges. Prereq: 596 or equivalent and consent of instructor. Sp

MAJOR

DEGREES

Ecology (College of Liberal Arts)

MAJOR

DEGREES
ecology for students from undergraduate programs in basic and applied biology, social sciences, mathematics, and engineering. Research opportunities in both fundamental and applied ecology are intended to prepare students for academic careers as well as professional positions in industry or government. The Environmental Sciences Division of the Oak Ridge National Laboratory, the national Park Service, and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

Requirements for admission to this program are:

1. admission to The Graduate School;
2. chemistry including organic, mathematics including calculus, and 3 semester hours of ecology at the upper division level;
3. departmental application and 3 rating forms;
4. Graduate Record Examination.

Application forms for admission should be obtained from The Graduate School and the Ecology Program. Inquiries concerning the admission requirements should be addressed to the Director, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37996-1610.

THE MASTER'S PROGRAM

Within the minimum requirements of The Graduate School, the program of study must include Ecology 573 and 574 or an approved equivalent and one course from an approved list of quantitative methods offerings. The list is available from the ecology office and is updated annually by the Ecology Curriculum Committee. The remainder of a student's course program is determined in consultation with the graduate committee. A listing of approved campus-wide ecology offerings is provided to each student during orientation. A graduate minor in ecology is available on an individual basis.

THE DOCTORAL PROGRAM

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

ADVISORS

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

Economics (College of Business Administration)

MAJORS DEGREES

Economics ......................... M.A., Ph.D.
Business Administration ................. MBA

Anne Mayhew, Head

Professors:
R. A. Bohm, Ph.D. Washington (St. Louis); R. L. Bowby, Ph.D. Texas; S. L. Carroll, Ph.D. Harvard; H. S. Chang, Ph.D. Vanderbilt; W. E. Cole, Ph.D. Texas; P. Davidson (Distinguished Professor), Ph.D.

Pennsylvania; G. R. Feiwel (Alumni Distinguished Service Professor), Ph.D. McGill; C. B. Garrison, Ph.D. Kentucky; H. W. Hitzog, Ph.D. Pennsylvania; G. L. Jensen, Ph.D. Texas; F. Y. Lee, Ph.D. Michigan State; A. Mayhew, Ph.D. Texas; J. R. Moore, Ph.D. Cornell, W. C. Neale, Ph.D. London School of Economics; K. E. Quindry (Emeritus), Ph.D. Kentucky; A. M. Schlottman, Ph.D. Washington (St. Louis); G. A. Spiva, Ph.D. Texas.

Associate Professors:
D. P. Clark, Ph.D. Michigan State; W. F. Fox, Ph.D. Ohio State; E. Glustoff, Ph.D. Stanford; K. E. Phillips, Ph.D. Washington (Seattle).

Assistant Professors:
J. A. Gauger, Ph.D. Iowa State; R. A. Hofler, Ph.D. North Carolina; D. M. Mandy, Ph.D. Illinois; J. W. Mayo, Ph.D. Washington (St. Louis); M. N. Murray, Ph.D. Syracuse; H. Thompson, Ph.D. Houston.

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 offers an area of concentration for the MBA degree. Students interested in the MBA program should contact the Associate Dean for Graduate Programs, College of Business Administration.

THE MASTER'S PROGRAM

Admission to the master's program is based on undergraduate academic performance and on scores from the general portion of the GRE or on scores from the GMAT. The student may choose either the thesis or non-thesis option. The non-thesis option requires 30 hours of course work at the 400 level or above. Of these, at least 24 hours (at least 18 hours of which are in economics) must be at the 500 level or above. Of the minimum of 18 hours in economics at the 500 level or above, 12 hours must consist of 511, 512 and 513, 514, and the remaining 6 hours must be in one field of economics. Of the 30 hours, a maximum of 9 hours in courses approved by the department may be taken in fields other than economics. Students electing the non-thesis option are required to pass a final comprehensive examination.

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

THE DOCTORAL PROGRAM

Admission to the Ph.D. program is based on promise of outstanding scholarship, as demonstrated by previous academic performance and by scores achieved on the general portion of the GRE or on the GMAT. Requirements for successful completion of the program consist of the four components listed below.
1. Students are required to complete the following core requirements:
   a. Economic Theory: Microeconomic theory by comprehensive examination or by completion of 511, 512 with a B+ average or higher, and macroeconomic theory by comprehensive examination or by completion of 513, 514 with a B+ average or higher.
   c. Mathematical and Quantitative Economics: 581, 582. The 582 requirement may be waived for students completing 681, 682.

   Students must achieve a grade average of B or higher over the courses offered to fulfill requirements in subparagraphs b and c, or, as an alternative, may petition to satisfy either or both of these two core areas by some other means such as a comprehensive written examination.

2. Students are required to demonstrate their competence by comprehensive examination or by completion of 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 or above 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 (500).

BUSINESS ADMINISTRATION CONCENTRATION
For complete listing of MBA program requirements, see Business Administration.

MBA Concentration: Economics
Minimum Courses Requirements for MBA Concentration: As approved by the area MBA faculty advisor.

400 Special Topics (3) Topics vary. Prereq: Determined by department.

415 History of Economics (3) Methods of study of doctoral history. Origins and evolution of major doctrines: classical and neoclassical economics, economics of Keynes and his followers, principal developments of second half of 20th century. Major writing requirement. Prereq: 201 or equivalent and consent of instructor.

424 Political Economy of World Development (3) Topics vary: Latin America, Asia, Soviet Union and Eastern Europe, cold war, international economic strategies, policies, and problems. Prereq: 201. This course includes a major writing requirement.


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

471 Public Finance: Optimal Government Functions and Expenditure Analysis (3) Problems of collective consumption, external effects, public investment, social decision making. Prereq: 201.

472 Public Finance: Taxation and Intergovernmental Relations (3) Analysis of individual taxes and of tax systems, major sources of revenue, fiscal federalism. Prereq: 201.

482 Introduction to Mathematical Economics (3) Application of algebra, matrix algebra, differential and integral calculus to micro and macroeconomics. Prereq: 201 and Mathematics 121-22 or 141-42.

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

501 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and application of optimizing techniques.

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

503 Business Conditions Analysis (3) Macroeconomic environment, determination of level of output and prices for economy as whole. Implications of aggregate fluctuations for individual firms. Role of forecasting techniques and stabilization policies.

510 Fundamentals of Microeconomics (3) Theory of consumer behavior and demand, theory of production and cost, behavior of the firm in perfectly competitive and monopolistic environments. For non-economics majors. Not available for students with credit for 511. Prereq: 311 or equivalent.

511-12 Microeconomic Theory (3,3) Theory of consumer choice and demand, theory of revealed preference, attributes of goods and implicit prices, market demand, labor supply, individual behavior under uncertainty, theory of firm, theory of production and cost, market structures, derived demand and pricing, introduction to welfare economics, market failure and theory of second best, pure exchange.

512-14 Macroeconomic Theory (3,3) Determination of national income, prices, and employment. Results using Keynesian, non-market-clearing, monetarist, and rational expectations paradigms.


525 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of Western civilization, major issues of method and interpretation. Prereq: Graduate standing in economics or consent of instructor.

526 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. Prereq: Graduate standing in economics or consent of instructor.

562 Labor Relations and Collective Bargaining (3) (Same as Management 522.)


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

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

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


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.


634 Comparative Economic Systems (3) Study and appraisal of alternative economic systems in comparative perspective.

641 Labor Economics (3) Theory of labor markets and wage determination under competitive conditions. Labor markets under conditions which interfere with competition, unions and discrimination. Human capital and estimation 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: Elementary microeconomics.

652 Topics in Monetary Theory (3) Advanced monetary models, issues in monetary policy, open economy monetary theory and policy. Student participation. Prereq: 615.

661 Regional and Urban Location and Development Theory (3) Theory of industrial and agricultural location and human migration. Economic basis for land-use patterns, central places, and urban form. Spatial interactions and urban processes. National policies for regional and urban assistance.

662 Methods of Regional and Urban Analysis (3) Theory of regional/urban economic structure and growth. Regional income and product accounts, shift and share analysis, economic base studies, and regional/urban input-output models. Theory and problem solution.

663 Environmental and Resource Economics (3) Topics in environmental quality, natural resource allocation by private markets, and issues in formulating public policy toward environmental problems.

CONCENTRATIONS

Administrative Theory and Practice

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

Theories of Curriculum Development and Foundations of Education

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

Instructional Theory and Practice

Specializations
1. Principles and models for instructional improvement
2. Elementary and early childhood instruction and practice
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. Vocational-technical fields of instruction and practice
8. Special education and rehabilitation

Theories and Practice of Educational and Personal Adjustment

Specializations
1. Counselor education
2. Counseling psychology
3. Educational psychology

Foundations of Human Movement

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

Health Education

Specializations
1. Public health
2. Safety

See College of Education for additional departmental listings.

601 Trans-College Seminar (1) Introduction to Ph.D. program in Education: research requirements, meaning of scholarship in academic and issues/problems in education. Minimum of two consecutive semesters preceded or followed by summer term required of all Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. May not be used to meet 600 requirement. S/NC only.

Educational and Counseling Psychology

(College of Education)

MAJORS

DEGREES

Guidance M.S., Ed.S.
Educational Psychology Ph.D.
and Guidance Ed.D.

Associate Professors:


Ph.D. students. Prereq: Admission to Ph.D. program or consent of Ph.D. program coordinator. May be repeated. May not be used to meet 600 requirement. S/NC only.

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 agency 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 community agency counseling, educational psychology, school psychology, and school counseling; and Doctor of Education with a major in Educational Psychology, concentrations in counselor education and educational psychology. The department also participates in the college-wide Ph.D. program with a major in Education. The concentration area is theories and practice of educational and personal adjustment with specializations in counselor education, counseling psychology, and educational psychology. The application deadline for admission to the doctoral programs is March 1, and to the Ed.S. and M.S. programs, March 1 and November 1. For information about the various programs of study and admissions, write the departmental admissions secretary.

Masters' Programs

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. The program in edu-
cational psychology requires a minimum of 36 hours, and the programs in educational psychology, school counseling or community agency counseling require 42 and 37 hours respectively. The programs in community agency counseling and in guidance each require supervised practicum and internship experiences working with clients. A final examination is required of all Master’s degree students.

**SPECIALIST PROGRAMS**

Admission requirements include up-to-date scores from the GRE, the departmental admissions application form and letters of recommendation. All programs include thesis and non-thesis options. The program in school psychology requires a minimum of 52 hours. When students are admitted to the Ed.S. programs in educational psychology, school counseling or community agency counseling, it is assumed that they have completed a Master’s degree. In this case, the minimum hours beyond the Master’s required to complete the Ed.S. are as follows: educational psychology, 24; school counseling, 22; and community agency counseling, 25. The specialist programs require supervised practicum and internship experiences with students or clients, either in the program psychology or, in the case of the counselor education programs, in an in community human services agencies. A final examination is required of all specialist students.

**THE DOCTORAL PROGRAMS**

The Ph.D. requires a major in Education and includes concentrations and specializations as listed under Education. For students applying to the Ph.D. programs, concentrations listed in the Departmental application form are required. The Ph.D. in Education program and one for the department that specifies which specialization is desired (i.e., counseling psychology, counselor education, or educational psychology). Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental application form. Departmental admissions requirements include up-to-date scores from the GRE; the department admissions application form; letters of recommendation; a writing sample; and, in the case of the counselor education program only, an in-person or video-taped sample of the applicant’s counseling work with a client.

The following minimum number of hours is required in each program concentration/specialization: School psychology - 98; counselor education, Ph.D. - 96, Ed.D. - 98; educational psychology, Ph.D. - 92, Ed.D. - 89. Residence for the Ph.D. programs is four consecutive semesters of full-time coursework and three consecutive semesters for the Ed.D. The Ph.D. program requires coursework work in both a supporting specialization and a cognate, as well as either foreign language competence and the programs in counseling psychology, counselor education and educational psychology. Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental application form. Departmental admissions requirements include up-to-date scores from the GRE; the department admissions application form; letters of recommendation; a writing sample; and, in the case of the counselor education program only, an in-person or video-taped sample of the applicant’s counseling work with a client.

The following minimum number of hours is required in each program concentration/specialization: School psychology - 98; counselor education, Ph.D. - 96, Ed.D. - 98; educational psychology, Ph.D. - 92, Ed.D. - 89. Residence for the Ph.D. programs is four consecutive semesters of full-time coursework and three consecutive semesters for the Ed.D. The Ph.D. program requires coursework work in both a supporting specialization and a cognate, as well as either foreign language competence and the programs in counseling psychology, counselor education and educational psychology. Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental application form. Departmental admissions requirements include up-to-date scores from the GRE; the department admissions application form; letters of recommendation; a writing sample; and, in the case of the counselor education program only, an in-person or video-taped sample of the applicant’s counseling work with a client.

The following minimum number of hours is required in each program concentration/specialization: School psychology - 98; counselor education, Ph.D. - 96, Ed.D. - 98; educational psychology, Ph.D. - 92, Ed.D. - 89. Residence for the Ph.D. programs is four consecutive semesters of full-time coursework and three consecutive semesters for the Ed.D. The Ph.D. program requires coursework work in both a supporting specialization and a cognate, as well as either foreign language competence and the programs in counseling psychology, counselor education and educational psychology. Applicants for the Ed.D. with a concentration in either counselor education or educational psychology fill out only the departmental application form. Departmental admissions requirements include up-to-date scores from the GRE; the department admissions application form; letters of recommendation; a writing sample; and, in the case of the counselor education program only, an in-person or video-taped sample of the applicant’s counseling work with a client.
E 665 Analysis of Research in Instructional Technology

F 664 Cognitive Interventions with Psychoeducational Skills, self instruction, cognitive restructuring, symbolic and social modeling and belief systems.


F 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.

F 664 Cognitive Interventions with Psychoeducational Problems (3) Cognitive approaches applied to coping skills, self instruction, cognitive restructuring, symbolic and social modeling and belief systems.

F 665 Analysis of Research in Instructional Technology (3) Research on human learning, design of learning environments. Analysis of teacher behavior, text development, and management of course or program of instruction in educational psychology. Prereq: 665, or consent of instructor.

E 668 Practicum in Instructional Planning (3) Development and management of course or program of instruction in educational psychology. Prereq: 668, or consent of instructor.

E 669 Internship in Educational Psychology (1-6) Supervised employment in departmentally-approved educational psychology internship sites. May be repeated. Maximum 12 hrs. S/NC only.


F 671 Personality and Vocational Assessment (3) Use and interpretation of personality and vocational measures in assessment of clients. Prereq: 525, 552 or consent of instructor.

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

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

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

E 678 Theory and Practice of Counseling Supervision (3) Theory and practice of supervision in counseling. Prereq: 675, or 674, or consent of instructor. S/N only.

E 679 Internship in Counseling Psychology (1-4) Supervised employment in departmentally approved counseling psychology internship sites. Prereq: Admission to counseling psychology doctoral program, and consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.

E 693 Independent Study (1-15) Independent investigation of problems in educational and counseling psychology. May be repeated. Maximum 15 hrs. S/NC or letter grade.

Educational Leadership

(Majors of Education)

DEGREES

Majors in Educational Psychology, Counseling Psychology, and Supervision..........................M.S., Ed.D., Ed.D.

Professors: Frederick P. Venditti, Acting Head

Majors in Educational Leadership..........................M.S.

Majors in Educational Administration and Supervision..........................M.S., Ed.S., Ed.D.

Fredrick P. Venditti, Acting Head

Assistants in Counseling Psychology, Counseling Psychology, and Supervision


The Department of Educational Leadership offers graduate programs leading to the Master of Science with majors in Educational Administration and Supervision and in College Student Personnel (higher education), the Specialist in Education, the Doctor of Education with a major in Educational Administration and Supervision, and the Doctor of Philosophy with a major in Educational Administration. Specializations may be developed in research, major central office positions, the principalship, and in other educational and social roles.

The Ed.D. program also offers a concentration in higher education. The instructional program combines theory and practice in an innovative demonstration of scholarly study and research. A blend of classroom instruction, individualized advising, and supervised practice and internships allows students to develop a specialization in academic administration, community-junior college administration, student personnel administration, financial management, and college teaching.

For additional information, contact the department head.

ADMISSION REQUIREMENTS

General test of the Graduate Record Examination; writing sample if GRE verbal is below 50th percentile; leadership potential judged by activities in organizations; rating forms or letters of recommendation. The Ed.D. applicant must also interview with at least 3 faculty members on campus or elsewhere. Application deadlines are February 1, July 1, and October 1.

M.S. IN EDUCATIONAL ADMINISTRATION AND SUPERVISION

Thesis Option

A minimum of 33 credit hours including 6 hours of Thesis 500. A thesis consists of a minimum of 18 hours. An internship is highly recommended but not required. A final oral examination is required with a written exam at the option of the committee.

Non-Thesis Option

A minimum of 36 credit hours is required with a minimum of 18 hours in the major. An internship is highly recommended but not required. A final written comprehensive examination is required with an oral exam at the option of the committee.

M.S. 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 39 hours, which includes 6 hours of practicum experience, is required in either option.

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

EDUCATIONAL SPECIALIST DEGREE

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 paper problems.

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. Three consecutive semesters of 604 must be taken during residency. An internship is highly recommended but not required. A foreign language requirement is at the discretion of the committee. A written comprehensive examination is given as well as an oral exam over the dissertation.

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

Educational Administration and Supervision

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 (3-5) May be repeated. S/NC only. E

513 Administrative and Organizational Theory in Education (3) Introduction to theoretical administrative and organizational foundations of management and leadership of educational programs and institutions. F,Su

515 Human Relations and Communication in Administration (3) Development and use of effective interpersonal communication skills and channels, intergroup relations, supportive work climates, 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 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 Environment (3) Socio-cultural, financial, social, psychological, and economic conditions of modern, complex society. Administrator and supervisory competencies: political, social, ethnic, cultural, and racial environments in which schools operate. Prereq: M.S. introductory core or consent of instructor. F,Su

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

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

547 Educational Facility Planning (3) Concepts and skills for development, evaluation, construction, renovation, maintenance, and operations of quality educational environments and facilities. Prereq: M.S. Introductory Core or consent of instructor. F,Su

548 Introductory Supervision and Personnel (3) Basic supervisory and personnel concepts and related competencies; building (or micro-organizational) level; interviewing, selecting, evaluating, 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. F,Su

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

554 School Law (3) Logical arrangement of case and statutory materials for public school administrators and teachers; problems concerning law and public education. Prereq: M.S. introductory core or consent of instructor. Sp,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 583 or 582. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su

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

586 Educational Leadership—Principalship (3) Knowledge, skills and relationships for principal to be effective instructional leader. Simulation materials and field-based activities. Culminating course with internship and problems paper. Prereq: 21 hrs in educational administration and supervision or consent of instructor. F,Su

590 Special Topics (3) May be repeated. E

592 Field Problems in Educational Administration and Supervision (3) Topic to be assigned. May be repeated. S/NC or letter grade. E

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

595 Elementary Principals Seminar (1-3) For in-service training of elementary school administrators. Development, problems, programs, and trends of elementary school administration and development of skill in elementary school administration. Prereq: Presently elementary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Su

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

597 Secondary Administrator Seminar (1-3) For in-service training of secondary school administrators. Development, problems, programs, and trends of secondary schools and management skills of secondary school administrators. Prereq: Presently secondary school administrator or consent of instructor. May be repeated. S/NC or letter grade. F,Su

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

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

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

611 Current Issues in Educational Administration (3) Curricular topics for instructional and research purposes, selected each semester and presented by instructor. Prereq: Presently school supervisor or administrator, or consent of instructor. May be repeated. S/NC or letter grade. E

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

615 Research Designs (3) Statistical methods through 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. Prereq: 614 or equivalent or consent of instructor. E

622 Programs for the Professional Preparation of Educators (3) Educational administration and supervision courses and methodology for training school administrators at both pre-service and in-service levels. F

629 Seminar in Politics of Education (3) Political theories and practices as they affect operation of public school systems and higher educational institutions. Interdisciplinary discussions of community power structures and political influence and impact of politics and research from education, sociology, and political science. Field inquiry. Prereq: 529, 616 or equivalent or consent of instructor. F

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

644 Educational Finance and Business Management (3) Contemporary educational finance policies and their influence upon education, nation and other educational agencies and systems and management of school logistical services. Prereq: 544 or consent of instructor. F,Su

646 School Personnel Administration (3) Personnel administration as a function of 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
Higher Education

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 only. 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, organizations, activities fees, tuition and related federal regulations. F

543 American Higher Education in Transition (3) History, philosophy, purposes, functions, organizations and programs in American higher education. F

570 Introduction to Student Personnel Work in Higher Education (3) Historical, philosophical and organizational perspective. Functional areas comprising field and major issues. F

572 Theory and Practice in Student Personnel Services (3) Theoretical framework of college student personnel services and practical application of theory in student services environment. Applicable administrative theory, human development theory and evaluation of current issues. Sp

588 The Community-Junior College (3) History and role of two-year college, major functions, organization and administration, problems and issues. Sp

593 Independent Study (3) Prereq: Consent of supervisory instructor. May be repeated. S/NC or letter grade. E

599 Practicum in College Student Personnel (1-3) Prereq: Consent of instructor. May be repeated. S/NC only. E

619 Administration and Governance of Higher Education (3) Trends, structure and process of collegiate governance. Development of understanding of administrative theory and practice in higher education. Prereq: 543 or consent of instructor. F

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

640 College and University Law (3) Legal precedent affecting organizations, administration, and finance of higher education. Academic freedom, faculty tenure, termination, religion, tort liability, administrative law, academic due process and affirmative action in employment. Sp

645 Curriculum and Instruction in Undergraduate Higher Education (3) Content and organization of institutional strategies and curricular structure in higher education. F, Su

650 Fiscal Problems in Higher Education (3) Revenue sources, appropriation process, budget procedures, cost analysis, and financial management in public and independent colleges and universities. Sp

653 Independent Study (3) Prereq: Consent of supervisory instructor. May be repeated. S/NC or letter grade. E

655 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, S, Su

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

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

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

Electrical and Computer Engineering

Degree Programs

MAJOR
Electrical Engineering

DEGREES
M.S., M.E., Ph.D.

Walter L. Green, Head

Professors:
I. Alexeff, Ph.D. Wisconsin, P.E.; J. M. Bailey, Ph.D. Georgia Institute of Technology; A. O. Bishop, Ph.D. Clemson; T. V. Blalock, Ph.D. Tennessee; W. O. Leffell (Emeritus), M.S. Tennessee; E. J. Kennedy, Ph.D. Georgia Institute of Technology; J. W. Cunningham (UTSI), Ph.D. Tennessee; R. A. Belz (UTSI), Ph.D. Tennessee; J. M. Rochelle, Ph.D. Tennessee; D. Rosenberg, Ph.D. New York; D. R. Hurd, Ph.D. Maryland; J. R. Roth, Ph.D. Cornell; F. W. Symonds, Ph.D. Nottingham (UK); J. D. Tillman, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.

Associate Professors:

The Electrical and Computer Engineering Department has a graduate committee to administer, promote, and grant the Ph.D. degree.

The Department of Electrical and Computer Engineering and the Department of Nuclear Engineering jointly offer a Master's degree program in the field of nuclear engineering. The department has an arrangement with the Oak Ridge National Laboratory for joint work in nuclear engineering. Students may have the opportunity to do their Master's thesis at the Fusion Energy Division of the Oak Ridge National Laboratory or at the Plasma Science Laboratory at the Massachusetts Institute of Technology. A limited number of Graduate Research Assistantships are available at each location. Further information about this program is available from the department.

MASTER OF SCIENCE PROGRAM
Graduate work leading to the Master of Science with a major in Electrical Engineering may be completed during one academic year of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, who may obtain the Master's degree in one calendar year.

MASTER OF ENGINEERING PROGRAM
A graduate program leading to the Master of Engineering is available to qualified graduates of ABET (Accreditation Board for Engineering and Technology)-accredited undergraduate curricula in electrical engineering or its equivalent. A minimum of one-third of the program must be in engineering design and one-third in one of, or a combination of, advanced math, computer science, social sciences, or engineering sciences.

ADMISSION REQUIREMENTS
Students applying for admission to the Master of Science or Master of Engineering program and who hold a B.S. in Electrical Engineering are considered for admission on the basis of the minimum grade point average of 3.0 for the senior year. Students who hold the B.S. or B.A. in a field other than electrical engineering are expected to have a minimum cumulative grade point average of 3.0 and a minimum senior year average of 3.0 in that field. These students should also have a background equivalent to that obtained by earning credit with a minimum 3.0 grade point average in the following undergraduate Electrical Engineering courses: 201, 202, 209, 301, 302, 311, 312, 319, 321, 322, 329, 331, 332, 339, 341, 342, 345, 351, 352, 359.
361 and two 400-level courses in the student's major area of concentration in the Master's program. Students from fields other than electrical engineering who have met the admission standards will be admitted only as non-degree students until a program of study is developed by each student and his/her advisor and is approved by the Electrical and Computer Engineering Graduate Committee. The program of study should include recommended undergraduate courses and graduate courses in electrical and computer engineering.

MASTER'S DEGREE REQUIREMENTS

Specific degree requirements which must be met include:

1. Electrical and Computer Engineering 503 and 504.
2. Six semester hours of graduate credit in mathematics consisting of mathematics courses of 400 level or higher which have been approved by the E.C.E. Graduate Committee.
3. An additional 12 semester hours of 500-level work in electrical and computer engineering courses or 6 semester hours of 500-level work in another area approved by the student's advisor and is approved by the Electrical and Computer Engineering Graduate Committee. The program of study is developed by each student and his/her advisor and is approved by the Electrical Engineering areas.
4. Master's thesis, totaling 6 semester hours or more.
5. A final oral examination covering the thesis and related coursework.

DOCTORAL PROGRAM

The Ph.D. with a major in Electrical Engineering may be pursued in the concentration areas of circuit theory, computers, electronics, communication theory, electromagnetics, plasma engineering, power systems, solid-state electronics, and control systems.

Applicants must submit scores on the General Graduate Record Exam. Specific departmental requirements for the Ph.D. include the following:

1. A Master of Science or Master of Engineering degree.
2. A minimum of 48 semester hours of course work beyond the B.S. excluding thesis, research, and dissertation credit.
   a. A minimum of 24 semester hours of work in electrical and computer engineering courses at the 500 and 600 levels.
   b. A minimum of 9 semester hours of 600-level course work. At least 3 semester hours of this work must be in an area other than the student's major area.
   c. A minimum of 12 hours of mathematics courses approved by the Electrical and Computer Engineering Graduate Committee. All 12 hours must be 400-level or above, and at least 6 hours must be at 500-level or above.
3. One foreign language if the student's faculty committee feels that a reading knowledge of a foreign language is crucial to the student's research 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 Ph.D. program. The qualifying examination is normally taken after the completion of 24 hours of graduate course work or immediately after completion of a Master's degree. A minimum of 18 hours of graduate course work must be completed after the student has taken the qualifying examination the first time.
5. Participation in departmental seminars.

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 provide special opportunities for academic and research work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.

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


413 Passive and Active Network Synthesis (3) Review of network analysis techniques, passive network driving point synthesis, transfer function synthesis, approximation theory, topics in active network synthesis. Prereq: 312.

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

422 Power Electronics (3) Industrial motor controls, phase control, variable frequency, motor characteristics, power HVDC, rectification, inverter, electromagnetic compatibility, VAR control, uninterruptible power systems; surge arresters. Prereq: 322.

425 Direct Electrical Energy Conversion (3) Principles and practices of energy conversion devices and systems. Prereq: 312.

426 Machines Lab (1) Experiments and projects demonstrating machine design. Coreq: 422.

429 Power Electronics Lab (1) Experiments and projects demonstrating power electronics.

431 Digital and Analog Integrated Electronics (3) Basic processing and fabrication of active and passive components for monolithic integrated circuits; characteristics of bipolar, MOS and JFET transistors in typical analog and digital integrated circuit designs; standard digital logic circuits including TTL, ECL, Schottky, NMOS, CMOS, and GaAs gates and arrays; design concepts for op-amps, comparators, references, regulators, and other linear functions. Prereq: 332. Coreq: 435.

432 Analog Signal Processing Electronics (3) Transducer signal and interfacing characteristics, analog integrated circuits: operational, instrumentation, and isolation amplifiers, rms and logarithmic converters, multipliers, and function generators; integrated circuit applications: active filters, level and phase detection, multiplexers, modulation and demodulation, samplers, and noise and distortion. Prereq: 332. Coreq: 436.

433 Electronic Amplifiers (3) Feedback amplifier principles; wideband linear amplifier design; radio frequency and audio power amplifier design; linear regulated power supply design; oscillator principles. Prereq: 332. Coreq: 435.


441 Digital Communications (3) Pulse and digital communication system principles. Sampling theorems; pulse amplitude, duration, and position modulation methods. Random signals and spectral analysis of noise as applied to communication systems. Quantization, coding, error correction, and detection; digital signals, carrier modulation with digital waveforms. Delta, adaptive delta, delta-sigma, delta PCM systems. Networking and network standards. Prereq: 342.

442 Antennas and Propagation (3) Linear antennas, arrays, or very simple microwave antennas; statistical and planar antenna parameter link parameters. Wave propagation in earth bound free space, earth's troposphere and ionosphere. Reflections from earth, effects on link reliability. Prereq: 342.


449 Microwave Circuits and Electronics Laboratory (1) Experiments and projects demonstrating microwave circuit and electronics. Coreq: 443.

451 Microprocessors in Computer Engineering (3) Project-oriented course. Instruction includes introduction to microcomputer. Coordinator to maintain program and development system with cross-compilers, file management, and emulation capability: interfacing and hardware/software trade-offs in
interrupt driven applications. Term grade dependent on number of projects completed, homework solutions, and engineering notebook. Prereq: 352. Coreq: 455.


453 Digital Acquisition Systems Laboratory (1) Experiments and projects demonstrating digital systems. Prereq: Coreq: 452.

455 Microprocessor Laboratory (1) Experiments and projects demonstrating microprocessors. Coreq: 451.

456 Digital System Design Laboratory (1) Experiments and projects demonstrating digital systems. Coreq: 452.


461 Plasma Magneto-hydrodynamic Engineering (3) MHD approximation; MHD waves and instabilities; MHD in static and dynamic systems; MHD in pulsed and steady state plasma devices. Applications such as fusion energy, industry, and astrophysics. Prereq: 361.

462 Plasma Kinetic Theory Engineering (3) Kinetic theory; beam-plasma system; driven waves in plasma; transition from multiple beams to continuum, Vlasov and Landau theory; microwave generation in plasmas and traveling wave tubes; free electron masers in circular geometry; gyrotron and orbitron. Design of plasma devices. Prereq: 351, 451 or consent of instructor.

463 Introduction to Fusion Energy I (3) High temperature plasma physics relevant to fusion plasma, principles of fusion reactors, and engineering and physics constraints on fusion reactors. Prereq: 361 or consent of instructor. (Same as Nuclear Engineering 463.)

464 Introduction to Fusion Energy II (3) Principles and phenomenology of tokamak reactor, alternate magnetic confinement concepts, advanced fusion fuel, fusion technology, plasma engineering, and fusion reactor design studies. Design project. Prereq: 463 or consent of instructor. (Same as Nuclear Engineering 464.)

469 Plasma Laboratory (1) Experiments and design projects for 461, 462, and 463, 464.

471 Introduction to Pattern Recognition (3) Design of learning and adaptive machines. Elementary decision theory, perception algorithm, Bayes classification rule, learning algorithms, elements of syntactic pattern recognition. Prereq: Consent of instructor.

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: Consent of instructor.


489 Electro-Optics Laboratory I (1) Experiments and projects demonstrating electro-optics. Coreq: 481.

494 Special Problems in Electrical Engineering (1-3) Problems involving library and experimental research. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

495 Senior Seminar (1) Topics of interest discussed in weekly seminar. Prereq: Consent of instructor. May be repeated. Maximum 2 hrs.

499 Electro-Optics II Laboratory (1) Experiments and projects demonstrating electro-optics. Coreq: 482.

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

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or fancy time before degree is completed. May be repeated. Not open to students who have taken FY 102. COREQ: 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 analysis, power spectrum and spectral analysis as applied to response of systems to random signals.

509 Linear Systems Theory (3) State space models of linear dynamical systems. State, observable, controllable, observability, realization theory, and stability theory.

512 Multivariable Linear Control System Design (3) Design of controllers, for multivariable systems, which satisfy constraints on robustness to plant uncertainties, disturbance rejection, command following. Prereq: 511.


516 Passive and Active Network Analysis and Synthesis I (3) Frequency and time domain techniques for network analysis, network reliability, synthesis algorithms.


521 Power Systems Analysis I (3) Matrix-vector representations of power networks, sequence modeling of power system components, unbalanced shunt and series faults. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prereq: 421 or equivalent.

522 Power Systems Analysis II (3) Operation and control of interconnected power systems, transient and dynamic stability. Formulating and solving problems in matrix-vector form with application to large scale power systems. Prereq: 521.


528 Advanced Electrical Machines I (3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for electromagnetic 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 components and devices; analog and digital logic circuits; transistors, diodes, bipolar transistors, JFETs, and MOSFETs. Small-signal equivalent circuits and noise models of active devices. Prereq: 431, 432, 433, or consent of instructor.


541 Electromagnetic Fields (3) Maxwell’s equations, special relativity, wave reflection and transmission, generalized media, guided waves, radiation from current and charge distributions. Prereq: 212.

543 Microwave Radiation and Propagation (3) Linear antennas, loop antennas, aperture antennas, optical transfer function. Canonical problems of modern geometrical theory of diffraction (GTD) for electromagnetic waves; geometric optics approximation, and accountings of far fields and near fields due to edge and surface diffraction. Horn, lens, and reflector antennas, computation of radar cross section. Prereq: 541.

544 Information Systems I (3) Mathematical treatment of information transmission in communication systems; modulation and demodulation; discrete and analog systems. System performance with noise and bandwidth constraints, sampling theorem. Quantization effects, digital filter design in real time and real frequency; digital signal processing. Prereq: 504.

546 Information Systems II (3) Wiener’s theory of filtering and prediction; correlation functions and computation for sampled signals; extension to nonlinear systems. Detection of signals in noise. Application to radar tracking, target resolution and accuracy, low-noise receivers. Prereq: 543.

548 Introductory Microwave Networks and Components (3) Scattering and transfer representation for multipoles; unilateral and bilateral microwave and millimeter wave devices. Operation and measurement by modern network analyzers. Electronic oscillators and amplifiers, frequency swept oscillators, transient time devices, parametric devices, mixers, switches.

551 Digital System Design I (3) Design considerations for combinational and sequential circuits, iterative networks. Fault diagnostics of logic circuits.

552 Digital System Design II (3) State identification and structure realization of sequential machines. Digital system architecture design; microprogramming and interrupt control. Prereq: 551.

556 Systems Analysis (3) Mathematical models and systems analysis techniques for network, approximation theory, active network, digital systems. Prereq: 518.

561 Plasma Diagnostics I (3) Principles of active, passive, perturbing and nonperturbing diagnostic methods. Based in low, intermediate, 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: 461, 463, or consent of instructor. (Same as Nuclear Engineering 561.)

562 Plasma Diagnostics II (3) Laboratory 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 462.)

563 Plasma Engineering (3) (Same as Nuclear Engineering 563.)

564 Fusion Technology (3) (Same as Nuclear Engineering 564.)

571 Pattern Recognition (3) Decision-theoretic and structural approaches to pattern recognition. Deterministic and statistical decision rules, feature extraction and image representation, and pattern recognition methods. Prereq: 472 or consent of instructor.


573 Robot Sensing (3) Design and applications of
## Engineering Science and Mechanics

### Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>631</td>
<td>Advanced Topics in Information Science I (3)</td>
<td>Detection theory; coding theory; system identification.</td>
</tr>
<tr>
<td>632</td>
<td>Advanced Topics in Information Science II (3)</td>
<td>Signals with unknown parameters; optimal filter synthesis; adaptive systems; sequential detection; suboptimal detection.</td>
</tr>
<tr>
<td>633</td>
<td>Electromagnetic Diffraction and Scattering (3)</td>
<td>Diffraction of electromagnetic waves by spheres, corners and cylinders; ground wave propagation; modern approximate methods; creeping waves, leaky waves.</td>
</tr>
<tr>
<td>634</td>
<td>Advanced Topics in Information Science III (3)</td>
<td>Structure of algebraic and probabilistic codes; linear codes, convolutional codes, error-correcting codes, decoding methods, identification schemes, deterministic, stochastic, and hierarchical methods.</td>
</tr>
<tr>
<td>635</td>
<td>Advanced Topics in Microwave Networks (3)</td>
<td>Microwave networks; multipport scattering and transfer representations.</td>
</tr>
<tr>
<td>636</td>
<td>Advanced Topics in Microwave Networks (3)</td>
<td>Reciprocal and nonreciprocal devices, directional couplers, high frequency switches and multiplexers, quadrature detector circuits.</td>
</tr>
</tbody>
</table>

### Special Topics (1-3)

- Advanced topics of current interest to Ph.D students in Electrical Engineering.
- May be repeated. Maximum 9 hrs.

### Doctoral Research and Dissertation (3-15)

- P/NP only. E

### Measurement Science I (3)

- Same as Nuclear Engineering 588, Chemical Engineering 586, Civil Engineering 586, Engineering and Mechanics 586, Mechanical Engineering 589, and Aerospace Engineering 589.

### Measurement Science II (3)

- Same as Nuclear Engineering 589, Chemical Engineering 586, Civil Engineering 589, Engineering and Mechanics 589, Mechanical Engineering 589, and Aerospace Engineering 589.

### Graduate Seminar (1)

- Topics of interest discussed in weekly seminar. May be repeated. Maximum 6 hrs.

### Special Topics (1-3)

- May be repeated. Maximum 9 hrs.

### Doctoral Research and Dissertation (3-15)

- P/NP only. E

### Electromagnetic waves with spatial and temporal dispersion and with fluctuation. Geometric theory of diffraction for electromagnetic waves, supported by results from canonical approximations of geometrical optics and physical optics. Field and power flux scattering.

### Advanced Topics in Wave Propagation (3)

- Electromagnetic waves with spatial and temporal dispersion and with fluctuation. Geometric theory of diffraction for electromagnetic waves, supported by results from canonical approximations of geometrical optics and physical optics. Field and power flux scattering. Single scattering radiative transport in tenuous particulate media; multiple scattering theory; coherent and incoherent transport. Pupil functions; network analyzer rough surface scattering. Prereq: Consent of instructor.

### 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.

### 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: 643. 

### Advanced Topics in Information Science III (3)

- Network analyzer measurement techniques and integration of measured data with design procedures. Prereq: Consent of instructor.

### Advanced Topics in Microwave Networks (3)

- Network analyzer measurement techniques and integration of measured data with design procedures. Prereq: Consent of instructor.

### Computer-Aided Design of VLSI Systems I (3)

- Fabrication of microelectronic devices; computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-52 or consent of instructor.

### Computer-Aided Design of VLSI Systems II (3)

- Computer-aided design tools; design and implementation of fully custom very large scale integrated (VLSI) circuits; design for testability; testing of fabricated chips. Prereq: 651.

### Computer-Aided Design of VLSI Systems I (3)

- Fabrication of microelectronic devices; computer architecture design; algorithmic state machines; partitioning; structured design methodology. Prereq: 551-52 or consent of instructor.

### Computer-Aided Design of VLSI Systems II (3)

- Computer-aided design tools; design and implementation of fully custom very large scale integrated (VLSI) circuits; design for testability; testing of fabricated chips. Prereq: 651.

### Advanced Plasma Physics I (3)

- Basic concepts of high temperature plasma physics. Magneto-hydrodynamics and kinetic descriptions of plasma, plasma transport, plasma waves, equilibrium, and stability. Prereq: Physics 541-42, 461-62 or 563-64, or consent of instructor. (Same as Physics 663.)

### Advanced Plasma Physics II (3)

- Plasma heating and radiation phenomena. Advanced topics of current interest. Must be taken in sequence. Prereq: 663. (Same as Physics 664.)

### Image Processing and Robotics I (3)

- Three-dimensional scene modeling and recognition, multi-sensor systems. Prereq: 572 or 573 or consent of instructor.

### Image Processing and Robotics II (3)

- Stereovision, shape theory. Prereq: 671.

### Image Processing and Robotics III (3)

- Time-varying imagery, path planning and navigation. Prereq: 672.

### 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

(Committee of Engineering)

### MAJOR

DEGREES

**Engineering Science**

- M.S., Ph.D.

**Jerry E. Stoneking, Head**

**Professors:**

- B. Attar (UTSI), Ph.D. Texas; A. Baker, M.S., Ph.D. Indiana; F. Beckman, M.S., Ph.D. North Carolina State; J. D. Landes, Ph.D. Lehigh; P.E.; C. W. Lee (Emeritus), Ph.D. Illinois Institute of Technology; T. D. McCay (UTSI), Ph.D. Auburn; P.E.; H. Pih, Ph.D. Illinois Institute of Technology, P.E.; C. J. Remenyik, Ph.D. Johns Hopkins; R. M. Roberts (Associate Dean, UTSI), Ph.D. Airforce Institute of Technology; W. E. Scott, Ph.D. Johns Hopkins; F. Shahroki (UTSI), Ph.D. Oklahoma; L. R. Shobe (Emeritus), M.S. Kansas State, P.E.; W. T. Snyder (Quan), Ph.D. Northwestern; J. E. Stoneking, Ph.D. Illinois, P.E.; J. Wasserman, Ph.D. Cincinnati, P.E.

### Assistant Professors:

- J. A. M. Boulet, Ph.D. Stanford.
- J. E. Caruthers (UTSI), Ph.D. Goergia Institute of Technology, R. C. Engels (UTSI), Ph.D. Virginia Polytechnic Institute; A. Mathews, Ph.D. Illinois, P.E.; M. H. McCoy (UTSI), Ph.D. Georgia; C. J. Myers (UTSI), Ph.D. Illinois; M. O. Soliman, Ph.D. Tennessee, P.E.; J. S. Steinhoff (UTSI), Ph.D. Chicago.

**Research Professor:**

- T. F. Moriarty, Ph.D. Illinois, P.E.

**Associate Professors:**

- J. E. Caruthers (UTSI), Ph.D. Georgia Institute of Technology, R. C. Engels (UTSI), Ph.D. Virginia Polytechnic Institute; A. Mathews, Ph.D. Illinois, P.E.; M. H. McCoy (UTSI), Ph.D. Georgia; C. J. Myers (UTSI), Ph.D. Illinois; M. O. Soliman, Ph.D. Tennessee, P.E.; J. S. Steinhoff (UTSI), Ph.D. Chicago.

**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, bio-medical 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 normally restricted to those students who have had significant engineering 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**

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering courses (Major concentration may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)</td>
<td>12</td>
<td>18 *</td>
</tr>
<tr>
<td>Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Thesis</td>
<td>6</td>
<td>—</td>
</tr>
</tbody>
</table>

*Engineering courses under option II may include advanced laboratory work or special problem work; for example, Engineering Science and and Mechanics 581 or analogous courses in other departments.

A final examination is required under both options covering graduate course work and the thesis.

THE DOCTORAL PROGRAM

Specific departmental requirements for the Ph.D. include:

1. A minimum of 72 semester hours beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 24 semester hours in Doctoral Research and Dissertation and a minimum of 48 semester hours in other courses.

2. A minimum of 24 semester hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 500 and above, with at least 9 semester hours of 600-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 12 semester hours in mathematics or computer science in courses numbered 400 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 6 semester hours of courses numbered 500 and above, offered in departments other than mathematics, computer science, and the student's major department and not included in the areas of committees.

5. Attendance and participation in graduate seminars and colloquia.

6. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master's degree or completed one or two areas of graduate credit. The purposes of qualifying examinations are:

a. To determine the qualifications of the student to continue the Ph.D. program, and

b. To identify the areas of strengths and weaknesses to guide the student's graduate course work and research.

The qualifying examinations 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 graduate course work required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and shall consist of both a written and oral portion.

7. 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.

8. 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.

**GRADUATE CREDIT FOR 400-LEVEL COURSES**

Four hundred-level courses in engineering may be used for graduate credit at the discretion of the advising committee. However, at least two-thirds of the minimum required credit hours in a Master's degree program must be at or above the 500 level.

421 Materials of Engineering (3) Mechanical properties of engineering materials; data collection and processing; time dependent and cyclic dependent properties.

423 Fracture-Safe Design (3) Critical review of variables controlling elastic and brittle fracture; stress intensity factors, strain energy release rates, fracture toughness, COD data, transition temperature tests; use of fracture toughness data in design.

425 Principles of Nondestructive Testing (3) Principles and theory of nondestructive testing methods; liquid penetrant, magnetic particle, eddy current, ultrasonic, acoustic emission, and radiographic methods. Laboratory. Prereq: 321, Materials Science and Engineering 201. (Same as Metallurgical Engineering 451.) 3 hrs or 2 hrs and 1 lab.

426 Principles of Biomechanics (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 acquisition and storage devices; evaluation of commercially available systems, selection and procurement methods, customization of systems, service maintenance and control programs for hospitals. Ethical issues and professionalism in clinical engineering. Prereq: 271, Electrical and Computer Engineering 302.

427 Biomechanics (3) Mechanical properties of living
Visiting Lecturer:

W. Dykeman, B.A. Northwestern.

Detailed information about the Master's and doctoral programs, and about individual graduate courses, may be obtained by writing to the Director of Graduate Studies in English, McClung Tower. For admission forms, write to The Graduate School.

THE MASTER'S PROGRAM

1. A minimum of 24 semester hours in the Department of English beyond the B.A.
   a. Six hours at the 600 level.
   b. Twelve additional hours at the 500-600 level. (A student may apply only 3 hours of 593 - Independent Study - toward the M.A. in English.)
   c. Six hours for graduate credit at any level, including the 400 level.

In this course work, students must maintain at least a B average.

2. A thesis, for which 6 semester hours credit are given. It will be written under the direction of a faculty member of the department and approved by him or her and two other members; or (non-thesis option) 6 hours of additional courses at the 500-600 level, making a total of 30 hours.

3. Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
   a. The completion of a second year of a language college level with a grade of C or better.
   b. The completion of French 302 or German 332 at The University of Tennessee with a grade of B or better.
   c. The passing of the regular Ph.D. foreign language examination as currently administered at The University of Tennessee.

4. A final examination. A candidate presenting a thesis must pass a ninety-minute oral examination, consisting chiefly of questions covering the general history of English and American literature, not merely the courses he or she has taken; a reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English. A non-thesis student must pass a written examination consisting of a one-hour oral examination, both of the same nature as the examinations taken by the thesis student.

Writing Concentration

The Master's with writing concentration is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry. Students who go on to complete the Ph.D. may also find the Master's with writing concentration helpful when they are seeking teaching positions.

1. A minimum of 24 semester hours beyond the B.A.
   a. Six hours at the 600 level.
   b. Twelve additional hours at the 500-600 level. (A student may apply only 3 hours of 593 - Independent Study - toward the M.A. in English.)
   c. Six hours of graduate credit at any level, including the 400 level. (Note: Writing students may substitute two 400-level writing courses for two 500-level courses.)

In this course work, students must maintain at least a B average.

A student must take at least 9 hours in writing and 9 in literature, the remaining 6 to be selected from any English courses at the proper level. Of these courses in writing, at least 3 hours must be taken at the 500 level; additional 500-level courses are strongly recommended.

2. Students in the program may choose one of the following writing projects, each for six hours:
   a. A thesis, using research to analyze some aspect of writing or rhetorical theory. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his or her project director. In addition to the director, two other English Department faculty members will supervise and approve the project; at least one should be drawn from the literature faculty.
   b. A creative project. A collection of poems or short stories, a short novel, a play, or a creative work of non-fiction prose are acceptable as creative projects. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his or her project director. In addition to the director, two other English Department faculty members will supervise and approve the project; at least one should be drawn from the literature faculty.

3. Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
   a. The completion of a second year of language college level with a grade of C or better.
   b. The completion of French 302 or German 332 at The University of Tennessee with a grade of B or better.
   c. The passing of the regular Ph.D. foreign language examination currently administered at The University of Tennessee.

4. A final examination. A candidate presenting a thesis or creative project must pass a ninety-minute oral examination, consisting chiefly of questions covering the general history of English and American literature, not merely the courses which he or she has taken; a reading list of primary works designed to help the student prepare for these questions is available in the office of the Director of Graduate Studies in English. This reading list may be modified by the M.A. examining committee, meeting in a body with the student, to reflect the candidate's particular writing emphasis, but most of the oral examination should focus upon the literature faculty.

THE DOCTORAL PROGRAM

1. Completion of a program of study normally 6 full semesters - approved by the candidate's committee or the Director of
Graduate Studies in English. This program will include:

(a) At least 57 semester hours beyond the B.A., divided as follows:
   (1) At least 24 semester hours at the 600 level.
   (2) At least 15 semester hours at the 500 level or above (a student may apply only 3 hours of 593 - Independent Study - toward the M.A. and 3 after the M.A.)
   (3) A special course in teaching composition.

(b) Twenty-four additional hours at any level included in the 400 level. Up to six of these hours may be taken in some cognate field or fields such as history, philosophy, French, or some other related disciplines. These courses must be drawn from those approved for graduate credit.

In this course work, students must normally maintain a 3.5 average.

NOTE: Students who have taken the M.A. with a thesis at The University of Tennessee, Knoxville, may omit one 500-level course and one 600-level course. Upon recommendation of the department, other doctoral candidates may include M.A. thesis credits as part of the required course work. If the student has an M.A. from another institution, he or she may normally transfer at least 24 hours, but the level of credit (400, 500, 600 level) for each course transferred will be determined by the Director of Graduate Studies in English after the student has entered the doctoral program.

(b) Twenty-four semester hours of dissertation. These represent the research for and writing of the dissertation. It will be directed by a faculty member of the department and approved by him or her and three or four other faculty members, including one from a field other than English. NOTE: Once a student has completed course work and foreign languages, he or she normally registers for English 600. Once a student does register for it, however, he or she must continue to do so, including the summer term, unless granted a leave of absence from The Graduate School. Such leaves are considered at the recommendation of the Director of the Graduate Studies in English. The dissertation must be drawn from those approved for graduate credit.

c. Successful completion of a language requirement in one of the following ways:
   (1) Two languages approved by the Director of Graduate Studies. The requirement for each language may be fulfilled in any of the following ways:
      (a) Completion of French 302 or German 332 with a grade of B or better.
      (b) Completion at The University of Tennessee of any two courses on the 300 level, or above, in the foreign language or literature with at least a grade of B in each course.
      (c) The passing of the regular Ph.D. foreign language examination as currently administered at The University of Tennessee.
   (2) One modern language approved by the Director of Graduate Studies in English. This requirement must be fulfilled in the following way: a passing mark on the language examination given by The University of Tennessee and completion of two courses given in the foreign language at the 400 level or above, one course at least to be at the 500 or 600 level. A minimum grade of B must be received in each course.
   (3) One modern language approved by the Director of Graduate Studies in English and course work in the English language. This requirement must be fulfilled in the following way: completion of a, b, or c in option 1 for one foreign language; completion of 6 semester hours in English language courses with grades of B or better, at least three of which must be from English 508 or 509, History of the English Language. For the other 3 hours, the student may either complete the history of the language sequence or choose one other course in language taught in the sequence or choose one other course in language taught in the Department of English at the 500 or 600 level and approved by the Director of Graduate Studies in English. These courses will not count toward the minimum number of courses for the Ph.D., and anyone electing this language option may not take the Ph.D. linguistics examination.
   d. Successful completion of several written comprehensive examinations divided as the department directs; see the English Department graduate brochure. The comprehensive examinations are given twice a year, normally in February and September. Before a student may begin to take them, he or she must have completed nearly all the course work required. A student must have met requirements for at least one of the foreign languages before beginning to take these comprehensive examinations; he or she must complete all language requirements before completing the examinations. Normal grading is P or F; an unusually fine examination may receive a grade of Distinction.

3. Residency for 2 consecutive semesters as a full-time student. For students not on teaching assistantships, full-time employment consists of at least 6 hours of courses or dissertation hours and 3 hours of teaching each semester.

401 Medieval Literature (3) Reading and analysis of selected medieval literary masterpieces in modern English.
402 Chaucer (3) Reading and analysis of Canterbury Tales and Troilus and Criseyde in Middle English.
404 Shakespeare I: Early Plays (3) Shakespeare's dramatic achievement before 1601. Reading and discussion of selected plays from romantic comedies, including Twelfth Night, English histories, including Henry IV, and early tragedy, including Hamlet.
405 Shakespeare II: Later Plays (3) Shakespeare's dramatic achievement between 1601 and 1613. Reading and discussion of selected plays from great tragedies, including Othello; problem plays, including Measure for Measure, and dramatic romances, including The Tempest.
406 Renaissance Drama (3) English theatre between 1580 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; prominent authors; Spenser, Wyatt, Marlowe, More, Sidney, and Bacon.
410 Milton, Donne and their Contemporaries (3) Principal achievements in prose and poetry of first two-thirds of seventeenth century; poetry of Milton, Donne, Marvell; and prose of Browne, Bacon, Walton.
411 Restoration and Eighteenth-Century Poetry and Prose (3) Dryden, Swift, Pope, Johnson, and their contemporaries; major works: MacFlecknoe, Rape of the 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, affective 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.
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 England (3) Literary consciousness and works of British women writers in nineteenth and twentieth centuries. (Same as Women’s Studies 422.)
431 Colonial, Federal, and Early National American Literature (3)
432 American Romanticism and Transcendentalism (3)
433 American Realism and Naturalism (3)
434 Modern American Literature (3) World War I to present.
435 American Novel before 1900 (3) From earliest sentimental novels through Brown and Cooper, and major figures to 1900: Hawthorne, Melville, Stowe, Clemens, and James.
441 Southern Literature (3) Southern writing from colonial period into twentieth century: frontier humorists, local color writers, and Southern literary renaissance.
442 American Humor (3) Early nineteenth century into twentieth century: Mark Twain.
443 Topics in Black Literature (3) Contents vary: particular genres, authors, or theories from 1845 to present: Langston Hughes and Harlem Renaissance, Richard Wright and Gwendolyn Brooks, writing by Black women, international Black literature in English, and Black American autobiography.
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 dramatists: Williams.
453 Continental Drama (3) Selection of plays (in English translation) by major European writers from late Renaissance to present; twentieth-century achievement.

454 Twentieth-Century International Novel (3) Joyce, Camus, Kafka, Nabokov.

455 Persuasive Writing (3) Persuasive strategies in both student and professional writing. Practice in mastering effective logical and emotional appeals.

456 Professional Writing (3) Principles and practices of writing for publication. Dissertation, theses, articles and reports; reference and technology. Prereq: 459 or consent of instructor.

459 Advanced Technical Writing (3) For students planning careers in industry, education, and government who need technical writing skills. Writing of definitions, process descriptions, sets of instructions, descriptions of mechanisms, recommendation reports, abstracts, proposals, and major reports. Prereq: Junior standing in student's major or consent of instructor.

460 Technical Editing (3) Editing technical material for publication. Principles of style, format, graphics, layout, and production management. Prereq: 456 and 459, or consent of instructor.

463 Advanced Poetry Writing (3) Further development of skills acquired in basic writing poetry course. Prereq: 363 or consent of instructor.

464 Advanced Fiction Writing (3) Further development of skills acquired in basic writing fiction course. Prereq: 365 or consent of instructor.

471 Sociolinguistics (3) Study of language in relation to society. Sociocultural and theoretical focus. Large-scale units: tribes, nations, social groups. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 471 and 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. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 472.)

474 Teaching English as a Second or Foreign Language I (3) Grammatical structures of English; particular grammatical difficulties of non-native learners of English. Basic phonological structures of English. Teaching grammar and phonology to non-native speakers: contrasts, and implications for cultural pluralism. Prereq: 371 or 372 or Linguistics 200 or consent of instructor. (Same as Linguistics 474.)

475 Teaching English as a Second or Foreign Language II (3) Second language acquisition theory. Issues in teaching; four language skills to learners of English. Materials and methods of language teaching and testing: preparation of materials. Observations of and teacher training with experienced staff member. Prereq: English 474. (Same as Linguistics 475.)


483 Topics in Literature (3) Topics vary. May be repeated. Maximum 6 hrs.

484 Special Topics in Writing (3) Original writing intended for publication, usually taught by professional author. Topics vary. May be repeated. Maximum 6 hrs.

485 Special Topics in Language (3) May be repeated. Maximum 6 hrs with consent of department. (Same as Linguistics 485.)

486 Special Topics in Criticism (3) Content varies. Theoretical and practical approaches to British and American literature. May be repeated with consent of department. Maximum 6 hrs.

489 Special Topics in Film (3) Content varies. Particularly directors, film genres, national cinema movements, or other topics. May be repeated with consent of department. Maximum 6 hrs.

497 Senior Honors I (3) Admission by consent of department.

498 Senior Honors II (3) Admission by consent of department.

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

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

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 assistants.

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 material, and transmitting of results of scholarship.

507 Applied Criticism: The Rhetoric of Literary Forms (3) Study and application of ways in which major critics have analyzed form in poetry and prose fiction.

508 History of the English Language I (3) Phonological, morphological, syntactic development of English language. Old and Middle English.

509 History of the English Language II (3) Phonological, morphological, and syntactic development of the English language with concentration on developments after 1000, especially in American English. Prereq: English 508.

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.

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 project or continuation of project begun in 483. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prereq: 483 or consent of instructor.

582 Special Topics in Writing (1-3) Topics vary. May be repeated. Maximum 6 hrs. Enrollment by consent of director of graduate studies only.

583 Analysis of Technical Writing (3) Theory and practice of technical writing. Exploration of current theories of technical, business, technical, academic, and government rhetoric. Analysis of shared elements and practice in producing such writing. Prereq: 459 or consent of instructor.

584 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.

590 Topics in Critical Theory (3) Topics vary.

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

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

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

594 Film History, Rhetoric, and Analysis (3) Film as narrative art form: historical development of film; the "rhetoric" of film; critical approaches to film study: genre, auteurs, formalist, and historical; critical analysis of individual films.

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

610 Studies in Old English and Literature (3) Old English grammar with readings in prose and poetry.

611 Studies in Beowulf (3) Translation and critical study of Beowulf. Prereq: English 610 or consent of instructor.

620 Studies in Medieval English Literature (3) Seminar in literature and literary genres of Medieval English literature, read in Old and Middle English. Subject matter varies from year to year.

621 Studies in Chaucer (3) Seminar in text, interpretation, and criticism of Chaucer's writings. Prereq: Previous course in Chaucer.


650 Studies in English Romanticism (3) Seminar content varies: particular literary figure or figures, genres, themes, 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) Southem literature before 1830, frontier, regionalism, women's literature, Irving, Cooper, Poe, Emerson, Thoreau, Hawthorne, Melville, Whittman, 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.

690 Special Topics (3) Content varies. History of ideas, humor, biography, autobiography, extra-literary disciplines.

Enzymology and Plant Pathology/Fields of Instruction

MAJOR

Entomology and Plant Pathology (College of Agriculture)

DEGREE

Entomology and Plant Pathology

MAJOR

Carroll J. Southards, Head

Professors:

E. C. Bernard, Ph.D. Georgia; R. R. Gerhardt, Ph.D. North Carolina State; J. W. Hilty, Ph.D. Ohio State; L. F. Johnson, Ph.D. Louisiana State; P. L. Lambdin, Ph.D. Virginia Polytechnic Institute; C. D. Piess, Ph.D.
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 may specialize in crop entomology, medical and veterinary entomology, insect ecology, insect pest management, or biological control. Students in plant pathology may specialize in foliar and stem fungus diseases, soil-borne diseases, plant nematology, or virology. For specific information, contact the department head.

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, 12 hours; (3) general inorganic chemistry, 6-8 hours; (4) organic chemistry, 3 hours. In addition, three completed rating forms and a written statement of career goals and interest in entomology or plant pathology are required.

DEGREE REQUIREMENTS

The program requires a written thesis based on original research and the completion of a minimum of 24 hours of course work for graduate credit, approved by the student's advisory committee. Included in the course requirements are two acceptable seminar presentations for 1 hour each. An oral final exam must be completed to the satisfaction of the advisory committee after the thesis has been completed. A minor is not required but may be selected at the option of the student. The minor will include 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.

Environmental Practice

(College of Veterinary Medicine)

MAJOR

Veterinary Medicine ....................... D.V.M.

J.B. Jones, Head

Professors:


Associate Professors:


Assistant Professor:


Instructors:

R. S. Funk, D.V.M. Ohio State; P. J. Morris, D.V.M. California (Davis).

See Veterinary Medicine for program description.

PROFESSIONAL COURSES

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.

857 Special Problems in Environmental Practice (1-8) Extramural 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.

GRADUATE COURSES

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

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

510 Plant Disease Fungi (4) Morphology, taxonomy, biology, and genetics of plant pathogenic fungi. Isolation and identification of plant pathogenic fungi. Prereq: 313 or consent of instructor. 2 hrs and 2 labs. F.A

511 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, causal agents and control measures. Prereq: 510 or consent of instructor. 1 hr and 2 labs. Su.A

512 Soil-Borne Plant Diseases (3) Causal agents, host-parasite-soil environment interactions, epidemiology, and control of soil-borne plant diseases. Prereq: 313. 2 hrs and 1 lab. F.A

520 Plant Parasitic Nematodes (4) Morphology, physiology, taxonomy, ecology, and management of plant parasitic nematodes, host-parasite relationships. Prereq: 6 hrs biological science or consent of instructor. 2 hrs and 2 labs. Sp.A

521 Plant Virology (3) Symptomatology, epidemiology, and management of virus infection: structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and spiroplasmas. Prereq: 313 or consent of instructor. 2 hrs and 1 lab. F.A

522 Plant and Soil Diseases (3) Causal agents, disease symptoms, causal agents and control measures. Prereq: 320, or Zoology 380, or consent of instructor. 2 hrs and 1 lab. Sp.A

530 Integrated Pest Management (3) Principles and application of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest populations below economic threshold levels. Prereq: 321, or consent of instructor. (Same as Plant and Soil Science 330). F.A

531 Special Problems in Entomology (1-3) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. E

532 Special Problems in Plant Pathology (1-4) Comprehensive individual study of current problems. May be repeated. Maximum 6 hrs. E

533 Concentrated Study in Entomology (1-3) Selected subjects in entomology for advanced students, concentrated in time and subject matter. Prereq: 321 or basic entomology course. May be repeated. Maximum 6 hrs. F.Sp

541 Seminar (1) Review of literature and current research in entomology and plant pathology. May be repeated. Maximum 3 hrs. E

585 Professional and Ethical Issues (3) Introduction to professional and ethical issues facing veterinary medicine today. May be repeated. Maximum 6 hrs. E

590 Special Topics in Environmental Practice (1-5) 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

593 In Vitro Evaluation of Toxicity (3) Principles and techniques of in vitro evaluation of toxicity, mutagenesis, carcinogenesis, and teratogenesis. Prereq: Biochemistry 561 and consent of instructor. Sp.A

594 Experimental Animal Surgery (3) Competence in performing human 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.

596 Pharmacology (4) Principles of pharmacokinetics and pharmacodynamics properties of drugs: mode of action, pharmacologic effects, chemical and physical properties, metabolism, toxicities, important idiosyncrasies and clinical applications. Prereq: Consent of instructor. F

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

610 Advanced Topics in Environmental Medicine (1-3) Current and future research methodology, laboratory situation, recent advances in instrumentation in analytical techniques for environmental medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

Finance

(College of Business Administration)

MAJOR

DEGREES

Business Administration ................. MBA, Ph.D.

H. A. Black, Head

Professors:

H. A. Black, Ph.D. Ohio State; W. W. Dotterweich (Wm. Voigt Professor of Insurance), Ph.D Pennsylvania; W. C. Goolsby, Ph.D. Wisconsin (Milwaukee); G. C. Philippatos (Distinguished Chaired Professor of Banking and Finance), Ph.D. New York; R. E. Shrieve (Faculty Scholar), Ph.D. California (Los Angeles).

Associate Professors:

A. L. Auxier, Ph.D. Iowa; T. P. Boehm, Ph.D. Washington (St. Louis); R. J. Clayton, Ph.D. Georgia; J. M. Wachowiak, Jr., Ph.D. Illinois (Champaign-Urbana), C.P.A.

Assistant Professors:

M. C. Ehrhardt, Ph.D. Georgia Institute of Technology.
Technology; D. C. Ketcham, Ph.D.
Pennsylvania State; J. P. Ogden, Ph.D.
Purdue; J. L. Trimble, Ph.D. Texas A&M;
A. L. Tucker, Ph.D. Florida State.

BUSINESS ADMINISTRATION

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

Ph.D. in Business Administration
Concentration
Finance
Minimum Course Requirements for Ph.D. Concentration: Finance Seminars 641, 642, 651, 652.


502 Registration for Use of Facilities (3-15) Required. May 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. Capital budgeting, financial structure, dividend policy and corporate growth and control. Prereq: 501.

512 Problems in Financial Management (3) Readings and cases that apply finance theory to real world investment, financing, and asset management problems. Prereq: 501.


599 Special Topics in Finance (3) Topics vary. Prereq: 501.

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 finance literature. Intertemporal asset pricing, signalling, arbitrage pricing theory, international finance.

652 Advanced Seminar in Finance II (3) Recent theoretical and empirical developments in finance literature. Market structure and theory of intermediation, structure of interest rates.

Food Technology and Science

(College of Agriculture)

MAJOR

Food Technology and Science .... M.S., Ph.D.

Hugh O. Jaynes, Head

Professors:

Associate Professors:
P. M. Davidson, Ph.D. Washington State; B. J. Demott, Ph.D. Michigan State; F. A. Draughon, Ph.D. Georgia; H. D. Loveday, Ph.D. Kansas State; J. R. Mount, Ph.D. Ohio State; M. J. Riemann, Ph.D. Kansas State.

Assistant Professors:

The Department of Food Technology and Science offers the Master of Science and Doctor of Philosophy degrees. Students in the doctoral program may choose research in the concentration area of food products, food chemistry, food microbiology, or sensory evaluation of foods. Commodity interests (meats, dairy, fruits, vegetables, bakery products) can be emphasized in any of the areas by careful selection of courses and the research topic. Minors are available in cognate fields. For detailed information, contact the department head.

Graduate School rating forms 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

1. Applicants must have a B.S. in food technology, food science, or a related agricultural or scientific discipline.

2. A thesis is required for the Master’s program. Prior to research for the thesis, the student must develop a detailed written research plan. Registration for a minimum of 6 hours of 500 Thesis is required.

3. In addition to the thesis requirement, a minimum of 24 semester hours of graduate course work is required. This work must be approved by the student’s committee and a minimum of 14 hours must be courses numbered above 500. All courses must be required courses. Undergraduate courses may be used toward degree requirements. May be repeated.

4. All students are required to include 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.

5. An oral examination covering the thesis and course work is required.

THE DOCTORAL PROGRAM

1. Completion of a Master’s degree in the field, or a closely related field, or passing a special qualifying examination is required for admission. Scores on the GRE aptitude test are also required.

2. A dissertation is required for the Ph.D. Each student must develop a detailed written plan for the dissertation research.

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 course work numbered above 500 are required exclusive of course work numbered above 500.

5. A minimum of 6 hours of courses for graduate credit must be taken outside the Department of Food Technology and Science.

6. All candidates will complete the following courses or their equivalent: 510, 521, 540, Animal Science 571, 572, and Nutrition and Food Sciences 511. All candidates must complete 601 and 640 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. A final oral examination is required that includes a defense of the dissertation and subject matter that the student’s committee considers appropriate.

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, 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.

429 Food Microbiology Lab (3) Methods for examination, enumeration, cultivation and identification of foodborne microorganisms. Prereq: Microbiology 210; Coreq: 420, F.


450 Dairy Products I (3) Procurement, processing and distribution of fluid milk. Manufacture of butter, frozen and condensed dairy products. Prereq: 140 or consent of instructor. 2 hrs and 1 lab. F.


460 Meat Products Technology (4) Processing methods for making cured, smoked, fresh, flaked and formed products. Effect of processing methods on product characteristics. Prereq: 350 or consent of instructor. 3 hrs and 1 lab. F.

470 Food Crop Products (3) Food products from plants; types, manufacturing systems, quality attributes and utility. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp. A.

480 Cereal Science and Bakery Products (3) Chemistry and technology of processing cereal grains, interactions of ingredients during production and storage of baked products. Prereq: 410 or 411 or equivalent. 2 hrs and 1 lab. Fall.

481 Advanced Cereal Science (3) Role of processing in modification of food properties; texture, flavor and color characteristics. Prereq: 440, 510, 511 or consent of instructor. Sp.

511 Color and Flavor of Foods (3) Chemical basis, instrumental methods for control of food manufacture, and storage of food products. Prereq: Chemistry 111. 2 hrs and 1 lab. Fall.

512 Special Topics in Food Technology and Science (1) Critical reviews of current research and production concerns of food industry. May be repeated. Max. 3 hrs. F.

521 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and relationship to food processing. Isolation of microorganisms from foods and plant equipment. Prereq: 420-29, 440, Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp.

522 Advanced Food Microbiology (3) Microorganisms in foods, their identification, characterization and relationship to food processing. Isolation of microorganisms from foods and plant equipment. Prereq: 420-29, 440, Biochemistry 410 or equivalent. 2 hrs and 1 lab. Sp.

540 Food Product Development (3) Art, science and technology of developing and marketing new food products. Prereq: 440. 2 hrs and 1 lab. F.

560 Advanced Meat Science (3) Physical and chemical changes that occur in conversion of muscle to meat, and postmortem treatment of meat quality, composition and palatability; packaging, preservation and quality control. Prereq: 460, 2 hrs and 1 lab. Sp.

580 Oilseed Products (3) Chemistry and technology of foods and food ingredients produced from oilseeds. Prereq: 410-11 or equivalent. 2 hrs and 1 lab. Sp.

Graduate study leading to the Master of Science with majors in Forestry and in Wildlife and Fisheries Science is offered by the Department of Forestry, Wildlife and Fisheries. The Master of Business Administration, with a concentration in forest industries management, is available for qualified students. This degree program is offered by the College of Business Administration with participation by the Department of Forestry, Wildlife and Fisheries. The Master of Business Administration is jointly offered by 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. This work must be approved by the student's committee no less than 10 hours of the minimum course work. The committee may require additional course work if the student's progress or background indicates such need.

2. At least one member shall be from outside the department in addition to the thesis requirement, a minimum of 24 hours of graduate course work is required. This work must be approved by the student's committee and no more than 10 hours of the minimum can be below the 500 level. The committee may require additional course work if the student's progress or background indicates such need.

3. At least one member shall be from outside the department. The committee will meet and schedule the student's program during the first semester of residence. The committee will meet and schedule the student's program during the first semester in residence.

4. An oral examination covering the thesis and course work is required.

Non-Thesis Option (Forestry only)

1. Thirty-five hours of graduate course work of which 23 must be at the 500 level or above is required.

2. A graduate committee of no fewer than 3 faculty members must be selected by the student. This work must be approved by the student's committee and no more than 10 hours of the minimum can be below the 500 level. The committee may require additional course work if the student's progress or background indicates such need.

3. 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.

4. A minimum of 30 hours of graduate course work is required.

5. Final comprehensive written and oral examinations shall be taken upon completion of no fewer than 28 hours of approved study.
Forestry

421 Forest and Wildland Resource Economics (3) Production functions, supply-demand and market analysis; market programs and projects; economic analysis and decision models; investment and financial analysis; managerial economics; taxes; forest products marketing. Prereq. 324 or consent of instructor. F

422 Forest and Wildland Resource Policy (3) Policy formulation; criteria for policy determination; forest and wildland law and regulation; theory of conflict resolution; formal and informal resolution. Prereq. Senior standing. F

423 Forest Recreation Planning and Management (3) Planning processes, master and site planning, site design projects; management strategies, methods of visitor and recreation site management; case studies; Weekend field trips. Prereq. 321, 323, Ornamental Horticulture and Landscape Design 280, or consent of instructor. 1 hr and 2 labs. F

431 Solid Wood Processing (3) Production processes for solid wood products: sawmilling, secondary machining, drying and preservation. Prereq. 331 and 332, or consent of instructor. 2 hrs and 1 lab. Sp

432 Wood Composites and Gluing (3) Principles of adhesive and composite wood products. Laboratory, normal and abnormal properties of plywood and composite panel manufacture. Evaluation resin properties; testing bond strength and durability. Prereq. 331 and 332, or consent of instructor. 2 hrs and 1 lab. F

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 Forrestry, Wildlife and Fisheries 313, or consent of instructor. Sp

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

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

511 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resources management. Identify, analyze and prepare written report. Topic and report must have approval of graduate committee. Available only to students in non-thesis option for M.S. in Forestry. E

512 Seminar (1) Current developments in forestry. Required of all graduate students in residence fall. May be repeated. Maximum 2 hrs. S/NC only. F

520 Advanced Forest Tree Biology (3) Growth, reproduction, and physiology of trees; forest ecology; variability and taxonomy of forest trees. Prereq. Graduate standing in forestry or biological science, or consent of instructor. Sp

530 Advanced Forest Resource Management (3) Analysis of forest management problems as exemplified in public agencies and private forests. Forest organization and computerized regulation systems; financial and operational planning tools, as applied to forest resource management. Prereq. Senior-level forest management or consent of instructor. Sp

540 Genetics in Forestry (3) Genetic improvement of forest trees, selection of superior phenotypes; field testing; non-market policies; and genetic research. Prereq. Biology 220 and at least 6 additional hrs in biological sciences. (Same as Botany 581). Sp

555 Forest Recreation Research Methods (3) Evaluation of research methodologies through readings and case studies. Application of research resources monitoring and research investigation; current research trends in woodland recreation. Prereq. 321 or equivalent and statistics. F

560 Industrial Forestry I (3) Economic structure of forest products industries. Identification and analysis of industry structure and markets, domestic and foreign. Current trends in markets and industrial structure. Impacts on short term and strategic planning. Prereq. Senior-level forest management or consent of instructor. F

565 Industrial Forestry II (3) Evaluation of alternative strategies for forest industry. Role of timber and timberland in integrated firm from standpoint of financial and strategic evaluations for different levels of self-sustaining capacity, nuisance policies, taxes, and legal aspects of fee and leasehold interests. Other financial and institutional arrangements affecting forest management and marketing strategies for private, industrial firms. Prereq. Senior-level forest management or consent of instructor. Sp

570 Management & Policy of Forest Resource Organization (3) Theory and application of management as applied to natural resource organizations; institutional direction and culture, and strategic management. Development of policy as planning tool and as results of environmental and conflict resolution. Linkage between policy development and execution, and structure and management of organizations. Prereq. Forest administration and policy or consent of instructor. F

580 Advanced Silviculture (3) Silvicultural characteristics, silvicultural practices and systems applied to commercially important hardwoods and softwoods. In-depth analyses of silvicultural principles involved and case studies; techniques of recreation resource analysis and decision models; computing of stand dynamics, structure, growth/yield. Prereq. Undergraduate silviculture course or consent of instructor. 2 hrs and 1 lab. Sp

581 Cytogenetics (3) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural and functional changes, genetic controls, hybridization, speciation, and polyploidy. Laboratory; normal and aberrant meiotic systems and somatic chromosomes from plants and animals. Prereq. Biology 220 and at least 6 additional hrs in biological sciences. (Same as Botany 581). Sp

585 Advanced Forest Biometry (3) Application of sampling techniques to forest inventory: fixed and variable sample plots; Poisson sampling; sampling estimation; multistage and multiphase sampling. Growth and yield predictors for even-aged and uneven-aged forests. Prereq. 325 or consent of instructor. F

593 Independent Study in Forestry (1-4) May be repeated. Maximum 6 hrs. E

Wildlife and Fisheries Science

441 Wildlife and Fisheries Techniques (3) Capturing and handling fish and wildlife; population restoration; food habit sampling; wildlife damage control; marking techniques; fish culture systems; management plans; track and sign identification. Prereq. Forestry, Wildlife and Fisheries 317. 1 hr and 2 labs. F

443 Fisheries Science (3) Quantification and management of freshwater fishes: population estimation, age and growth, biological assessment, and stocking. Prereq. Forestry, Wildlife and Fisheries 317 or Biology 250, and 6 hrs of mathematics. 2 hrs and 1 lab. Sp

444 Ecology and Management of Wild Mammals (3) Biological and ecological characteristics of game mammals and non-game species, invasion of exotic species, and practices of wild mammal management. Prereq. Forestry, Wildlife and Fisheries 317 or Biology 250. 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 317 or Biology 250. 2 hrs and 1 lab. Sp

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

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

530 Wildlife Diseases (2) Necropsy of birds and mammals. Recognition of various diseases and methods of preparing pathological materials in field and laboratory. Investigative procedures concerning wildlife diseases. Prereq. 1 yr biology, 444 or 445, or consent of instructor. F

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

550 Fish Physiology (3) Mechanisms of circulation, excretion, osmoregulation, and neural/hormonal control of these systems in fishes. Practical applications of fish physiology in water pollution assessment, fish culture and management. Prereq Senior or graduate standing in biological sciences. Sp

560 Advanced Topics in Wildlife and Fisheries Science (3) Recent advances and concepts, research techniques and analysis of current problems. Prereq. 443, 444, 445, or consent of instructor. May be repeated. Maximum 6 hrs. E

593 Independent Study in Wildlife and Fisheries Science (1-4) May be repeated. Maximum 6 hrs. E

French

See Romance Languages

Geography

(Stated by College of Liberal Arts)

MAJOR

DEGREES

Geography ........................................... M.S., Ph.D.

Sidney R. Jumper, Head

Professors: C. S. Aiken, Ph.D. Georgia; T. L. Bell, Ph.D. Iowa; E. H. Hammond (Emeritus), Ph.D. California (Berkeley); R. J. Jumper, Ph.D. Tennessee; G. Long (Emeritus), Ph.D. Northwestern; C. W. Minkel, Ph.D. Syracuse; C. T. Paludan (UTSI), Ph.D. Denver; T. H. Schmudde, Ph.D. Wisconsin; J . W. Wilbanks (Adjunct), Ph.D. Syracuse.

Associate Professors: W. L. Brinkman, Jr., Ph.D. Wisconsin; J. R. Carter, Ph.D. Georgia; R. Foresta, Ph.D. Rutgers; L. Pulsipher, Ph.D. Southern Illinois; B. Ralph, Ph.D. Northwestern; J. B. Reider, Ph.D. Louisiana State.
Assistant Professor: T. J. Biasing (Adjunct), Ph.D. Wisconsin.

The department offers the Master of Science and Doctor of Philosophy degrees. The Master's program requires 30 hours of study, and the Doctor of Philosophy program requires 72 hours of study beyond the completion of a Master's program. Both options require a minimum of 24 semester hours beyond the completion of a undergraduate major program. At least two-thirds of the total hours in the degree program must be at or above the 500 level. Students must achieve the equivalent of a comprehensive Master's program before they will be admitted to the doctoral program. Course requirements for the degree shall be determined by the student's faculty committee in accordance with specific interests and needs. The program of study must include sufficient course work within the student's area of interest as defined by individual students. Prereq: written consent of instructor. Maximum 9 hrs. S/NC only.

411 Computer Mapping and Geographic Information Systems (3) Concepts, management, and presentation of digital data for spatial analysis; cartographic data structures. Prereq: 310 and knowledge of computer language or consent of instructor. 2 hrs and 1-2 hr lab.

412 Cartography (3) Cartographic techniques applied to design, compilation, and reproduction of maps and other graphics. Prereq: 310 or consent of instructor. 2 hrs and 1-2 hr lab.

413 Remote Sensing: Types and Applications (3) Principles and uses of remote sensing imagery, digital data, and spectral data; geographic interpretation and mapping techniques. Prereq: 310 or consent of instructor.

415 Quantitative Methods in Geography (3) Geographic application of statistical techniques, point pattern analysis, and analysis of areal units. Prereq: Mathematics 115 or two semesters of calculus or consent of instructor.

421 Geography of Folk Societies (3) Geographical study of folk culture, traditional material culture and rural settlement patterns from eastern North America and selected foreign areas. Prereq: 101-02 or 320 or consent of instructor.

425 Historical Geography of the United States (3) Survey of changing human geography of United States during four centuries of settlement and development. Changing population patterns, development of agricultural, cultural regions, and patterns of urban-industrial development. Prereq: 361 or consent of instructor.

433 The Land-Surface System (3) Nature and regional variation in relationships among surface form, water, vegetation, and surface materials. People as evaluators and agents of change. Prereq: 131-32 or 330 or consent of instructor.

434 Climatology (3) Overview of general circulation system leading to world pattern of climates. Climatic change and modification, and interrelationships of climate and human activity. Prereq: 131-32 or 330 or 334 or consent of instructor.

441 Urban Geography (3) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. Prereq: 101-02 or 141 or 340 or consent of instructor. (Same as Urban Studies 441.)

443 Rural Geography (3) Geographical appraisal of rural areas of United States: small towns and urban fringes. Problems and potentials of rural America. Prereq: 101-02 or 141 or 340 or consent of instructor.

445 Geography of Resources (3) Study of factors related to variations in resource availability from time to time and place to place; energy and metallic resources. Prereq: 101-02 or 141 or 340 or consent of instructor.

449 Geography of Transportation (3) Examination of transportation systems, their effects on trade patterns, land use, location problems, and development. Prereq: 141 or 340 or consent of instructor.

450 Process Geomorphology (3) (Same as Geology 450.)

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

501 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration required of resident graduate students whenever offered. May be repeated. Maximum 4 hrs. May be applied toward graduate degree. S/NC only.

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

503 Introduction to Geographical Research (3) Aims of geographical research; survey of printed source materials; practice in effective presentation of research findings.

504 Research Design (3) Development of research problems, preparation of appropriate study designs, and practical field application. Prereq: 503 or consent of instructor.

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 only.

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 only.

509 Topics in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

512 Topics in Cartography (3) Trends, concepts, problems and methods in cartography. Prereq: 411 and 412 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

513 Topics in Remote Sensing (3) Applied research using imagery for interpretation and mapping of geographic data. Prereq: 413 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

515 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography; research problems utilizing appropriate computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 415 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

519 Graduate Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of department prior to registration. May be repeated with consent of instructor. Maximum 6 hrs.

521 Topics in Cultural Geography (3) Examination of trends, concepts, and methods in cultural geography. Prereq: 425 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

524 Topics in Political Geography (3) Geographic consequences of public decisions; understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

525 Topics in Historical Geography (3) Examination of trends, concepts, and methods in historical geography. Prereq: 425 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

533 Topics in Physical Geography (3) Examination of trends, problems, and methods in geography of land surface system or in modern climatology. Prereq: 433 or 434 and consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

541 Topics in Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 441 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

549 Topics in the Geography of Transportation (3) Examination of trends, problems, and methods in transportation geography and transportation networks. Prereq: 449 or consent of instructor. May be repeated with consent of instructor. Maximum 6 hrs.

550 Regional Geomorphology (3) (Same as Geology 550.)

591 Foreign Study (1-15) See page 31. Prereq: Written consent of department prior to registration.

592 Off-Campus Study (1-15) See page 31. Prereq: Written consent of department prior to registration.

593 Independent Study (1-15) See page 31. Prereq: Written consent of department prior to registration.

595 Geographic Concept and Method (3) Traditional and emerging geographic thought; readings on natural scope, problems, and methods of geography. Prereq: Consent of instructor.

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

605 Seminar in Geography (2-3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

625 Seminar in Historical Geography (3) Prereq: 525 or consent of instructor. May be repeated. Maximum 6 hrs.
533 Seminar in Physical Geography (3) Prereq: 533 or consent of instructor. May be repeated. Maximum 6 hrs.
641 Seminar in Urban Geography (3) Prereq: 541 or consent of instructor. May be repeated. Maximum 6 hrs.
643 Seminar in Rural Geography (3) Prereq: 443 or consent of instructor. May be repeated. Maximum 6 hrs.
649 Seminar in Geography of Transportation (3) Prereq: 549 or consent of instructor. May be repeated. Maximum 6 hrs.
663 Seminar in Geography of the American South (3) Prereq: Consent of instructor. may be repeated. Maximum 6 hrs.
673 Seminar in Geography of Latin American (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Geological Sciences
(College of Liberal Arts)

MAJOR DEGREES
Geology: M.S., Ph.D.

Kenneth R. Walker, Head

Professors:
R. D. Hatcher (Distinguished Scientist), Ph.D.
H. E. Klepser (Emeritus), Ph.D.
Ohio State; O. C. Kopp, Ph.D.
Ohio; L. E. McLaughlin (Emeritus), Ph.D.
Pennsylvania State; C. C. Misra, Ph.D.
Ontario; L. A. Taylor, Ph.D.
Lehigh; L. N. Walker (Emeritus), Ph.D.
Yale; J. G. Wells (Emeritus), Ph.D.
North Carolina.

Associate Professors:
T. W. Broadhead, Ph.D.
D. W. Byerly, Ph.D.
Texas; G. M. Clark, Ph.D.
Tennessee; T. C. Labotka, Ph.D.
Emeritus; M. L. McKinney, Ph.D.
California Institute of Technology; R. T. Williams.
Ph.D.
Virginia Polytechnic Institute.

Assistant Professor:
R. W. Arnsen, Ph.D.
Northwestern; P. A. Delcourt, Ph.D.
Minnesota; S. G. Driese, Ph.D.
Wisconsin; M. L. McKinney, Ph.D.
Yale; N. B. Woodward, Ph.D.
Johns Hopkins.

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 to a graduate program, an applicant must provide transcripts of previous university work, two rating forms or letters of recommendation, and GRE scores, including the subject exam in geology (or in another area if geology was not the area of previous university-level concentration). Students are not admitted under provisional or non-degree status.

THE MASTER'S PROGRAM
Prerequisites are the Bachelor's degree including course work in mineralogy, petrology, stratigraphy/sedimentation, paleontology, structural geology, optical mineralogy, and field geology; one year of course work at the introductory level in chemistry, calculus, and either physics, biology, or statistics.

Completion of the degree includes maintenance of a minimum 3.0 average in all graduate course work and successful defense of the thesis. Failure to achieve a 3.0 GPA for two successive semesters will terminate a student's status in the degree program.

Course requirements include a minimum of 30 hours of graduate credit that include 6 hours of Thesis 500 and at least 14 hours of graduate course work at or above the 500 level. At least 23 hours must be taken within the department. Students who have not had an undergraduate field course must take 440 or another approved course. Research for 595 is required each semester; however, not more than 2 hours S/NC credit may be applied toward the degree.

THE DOCTORAL PROGRAM
Prerequisites are the Bachelor's degree requirements of the M.S. plus a Master's degree in geology or related field.

Completion of the degree includes maintenance of a minimum 3.0 average in all graduate course work, satisfactory performance on the comprehensive exam taken not later than the end of the second year, and successful defense of the dissertation. Failure to achieve a 3.0 GPA for two successive semesters will terminate the student's status in the degree program.

Course requirements include a minimum of 26 hours of graded courses for graduate credit and at least 24 hours of Dissertation 600. The 26 hours must include a minimum of 18 hours of 500 level or higher of which at least 6 hours must be at the 600 level. Students who have been granted the opportunity to bypass the M.S. must take at least 38 hours of graded courses for graduate credit of which a minimum of 25 hours must be at the 500 level or above with at least 6 hours at the 600 level.

410 Advanced Mineralogy (3) Crystal chemistry of rock-forming minerals. Introduction of electromagnetic radiation and crystalline solids. Optical properties of minerals, visible and infrared spectroscopy, and x-ray diffraction. Laboratory emphasis on 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 Protista, Porifera, Cnidaria, Bryozoa, and Brachiopoda. Functional morphology, 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': Annelida and other worms, Mollusca, Arthropoda, Echinoderma, Graptolida, Chordata. Functional morphology, skeletal structures, ecology, and stratigraphic distribution. Prereq: 320 or consent of instructor: 2 hrs and 1 2-hr lab.
425 Evolution and Geologic Record (3) Evolution of life viewed from fossil record. Extinction, mass extinctions, and evolutionary rates. Prereq: 320. 2 hrs and 1 seminar.
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; changes in floras 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 on-campus at Geology Field Station and requires full time of student. Field techniques demonstrated, practiced, and applied to solution of geologic problems. Prereq: Completion of major core courses and consent of instructor.
450 Process Geomorphology (3) Integrative approach to development of surface of earth based upon case histories, maps, remote sensing imagery. Prereq: 101-02. (Same as Geography 450.) 2 hrs and 1 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 geologic problems. Chemical crystal and relation between basic atomic structure and distribution and behavior of elements in earth's crust. Prereq: Chemistry 120-30. Recommended prereq: 330. 2 hrs and 1 lab.
470 Applied Geophysics (3) Basic principles and applications of seismic, gravity, magnetic, and electrical prospecting methods. Recommended prereq: Mathematics 141-42 or 147-48 and Physics 131. 2 hrs and 1 lab.
480 Principles of Economic Geology (3) Ore-forming processes, classification of mineral deposits, survey of different types of mineral deposits with examples, and metallogenesis. Prereq: 310 and 350 or equivalences. Recommended prereq: 490. 2 hrs and 1 2-hr lab.
500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
510 Clay Mineralogy (3) Origin, chemistry, structures, and properties of clay minerals; application of mineralogical and chemical techniques to 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.
525 Biostratigraphy (3) Examination of principles of biostratigraphy and stratigraphy through selected case histories. 1 hr and 1 2-hr seminar.
530 Petrogenesis of Crystalline Rocks (4) Origin and characteristics of igneous and metamorphic rocks, magmatic and subsolidus processes and physical conditions. Laboratory involves petrographic study of crystalline rocks in thin section. Prereq: 410. 3 hrs and 1 lab.
540 Seminar in Local Geology (1) Introduction of geology of Southern Appalachians. 1 hr plus field trips.
545 Sandstone Petrology/Physical Sedimentology (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 carbonate sediments and diagenesis and diagenetic processes and diagenesis of resultant rocks; field and laboratory analysis of sample material and preparation of scientific reports. 3 hrs and 1 lab.
550 Regional Geomorphology (3) Integrative approach to study of natural geomorphological regions stressing links and similarities across boundaries, unique characteristics of major divisions, provinces, sections, and districts. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Geography 580.)

555 Seminar in Quaternary Studies (3) Interdisciplinary seminar on specific regions of geologic interest, and seminars on specific aspects of Quaternary and paleoceanography. May be repeated with consent of instructor. Maximum 6 hrs. (Same as Botany 555 and Zoology 555.)

556 Quaternary Geology of North America (3) Interpre- tation of geomorphic, stratigraphic, and sedimentologic evidence in order to reconstruct Quaternary landscapes, environments, paleo-vegetation, and paleoclimatic conditions of the North American continent and adjacent regions of the Pacific and Southern Oceans. Prereq: Consent of instructor. Maximum 6 hrs. (Same as Earth Science 555).

557 Quaternary Paleoclimatology (3) Perturbation, process, and pattern within Quaternary ecosystems, climatic change and vegetational responses during last 2.5 million years. Prereq: Consent of instructor.


561 Aqueous Geochemistry (4) Introduction to and applications of equilibrium thermodynamics to earth surface environments; geochemistry of natural water, weathering reactions, and sediment diagenesis. Prereq: Chemistry 120-30, 3 hrs and 1 lab or seminar.


566 Geochanical Analysis (3) Collection and treat- ment of geochemical data using electron microprobe, x-ray fluorescence, and atomic absorption spectrophotometry techniques. Prereq: 310 or consent of instructor. 2 hrs and 1 lab.

569 Experimental Geochemistry Laboratory (1-3) Independent lab study of problems in geochemistry using experimental and analytical techniques. Prereq: Consent of instructor.

570 Advanced Structural Geology (4) Current topics in structural geology and tectonics of mountain belts; recent literature. Prereq: 370 or equivalent, or con- sent of instructor. 3 hrs and 1 lab or seminar.

575 Plate Tectonics and Orogeny (4) Tectonic development of orogenic belts in context of newest aspects of plate tectonic theory, current literature, and ongoing research for both modern and ancient examples. Prereq: 370 or consent of instructor. 3 hrs and 1 seminar.

580 Ore Petrology (3) Detailed study of selected ore deposits; petrology of ore-gangue assemblages. Prereq: 400 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 19 hrs.

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

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

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

594 Field Problems in Geology (1-2) Literature study and seminars on specific regions of geologic interest, supplemented by extended field trip. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

595 Selected Topics in Geology (1) Presentation of graduate, faculty, and visiting scientist research. Registration required each semester except summer for resident full-time graduate students. S/NC only.

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

610 Seminar in Mineralogy (2) May be repeated with consent of department. Maximum 6 hrs.

620 Seminar in Paleontology (2) May be repeated with consent of department. Maximum 6 hrs.

630 Seminar in Petrology (2) May be repeated with consent of department. Maximum 6 hrs.

640 Seminar in Sedimentary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

650 Seminar in Geomorphology and Quaternary Geology (2) May be repeated with consent of department. Maximum 6 hrs.

660 Seminar in Geochemistry (2) May be repeated with consent of department. Maximum 6 hrs.

670 Seminar in Structural Geology (2) May be repeated with consent of department. Maximum 6 hrs.

680 Seminar in Economic Geology (2) May be repeated with consent of department. Maximum 6 hrs.

---

**Germanic and Slavic Languages**

(College of Liberal Arts)

**MAJORS**

**DEGREES**

German ................................................. M.A.
Modern Foreign Languages .................. Ph.D.

Henry Kratz, Head

Professors: J. E. Falen, Ph.D. Pennsylvania; D. M. Fiene, Ph.D. Indiana; H. W. Fuller (Emeritus), Ph.D. Wisconsin; H. Kratz, Ph.D. Ohio State; J. C. Osborne, Ph.D. Northwestern; M. P. Rice, Ph.D. Vanderbilt.

Associate Professors: N. A. Lauckner, Ph.D. Wisconsin; D. E. Lee, Ph.D. Stanford; C. J. Mellor, Ph.D. Chicago; U. Ritzenhoff, Ph.D. Connecticut.

Assistant Professors: C. Hodges, Ph.D. Chicago; J. I. Koldziej, Ph.D. Indiana.

---

The Department of Germanic and Slavic Languages offers two advanced degrees: the Master of Arts in German and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department.

**MASTERS PROGRAM**

The department requires a minimum of 30 semester hours including 15 hours of course work above the 600 level and 6 hours of Thesis 500.

**THE DOCTORAL PROGRAM**

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

**Admission Requirements**

Applicants must have completed a B.A. in either French, German or Spanish to be accepted into this program. Both graduates of institutions in the United States and those with undergraduate degrees from institutions outside the United States must have a grade point average of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them. Applicants should present scores that are no lower than the 40th percentile on the Graduate Record Examination (GRE) subject test in the foreign language of their first concentration.

**Requirements for the Ph.D.**

Candidates must complete a minimum of 36 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program shall consist of a first concentra- tion, a second concentration, and a cognate field.

1. **First Concentration**: French, German or Spanish. It will consist of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:

   A minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); Italian 521-22 (1,1), French 512 (2), or Spanish 512 (2); French 515-16 (2,2), or German 520 (3).

   At least 12 hours at the 600 level (exclu- sive of dissertation hours).

2. **Second Concentration:** French, German, Italian, or Spanish (different from the first concentration). It shall consist of at least 18 hours beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. **Cognate Field:** Six hours must be in courses numbered 400 and above in a field outside the department of the first concentra- tion 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 sec- tion concerned.

4. **Additional Requirements:** A student must demonstrate competence in languages of both his/her first and second concentra- tions 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 pur- pose 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 lan- guage as his or her cognate area, basic competence (determined by a reading exami- nation of translation into English administered by the department concerned) in a third language is required. If the stu- dent's first and second languages are Romance languages, the third language should be chosen from another language branch.

   A comprehensive examination on the lan- guage and literature of the first and second concentrations must be passed before the student may be admitted to candidacy. The candidate will be required to defend his/her...
dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate’s scholarly qualifications.

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct in at least two foreign languages, subject to staffing needs.

Doctoral students will be strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g., Fulbright, McClure, Rotary fellowships).

For additional courses, refer to Romance Languages.

**German**

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
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 change, 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.)

435 Structure of the German Language (3)
Contrastive English-German segmental and suprasegmental phonemes, contrastive English-German linguistic structures, selected topics in advanced German grammar and syntactic analysis. Prereq: 6 hrs of upper division German language courses (excluding courses in translation and graduate reading courses). (Same as Linguistics 435.)

436 History of the German Language (3)
Development of German language from Indo-European through Proto-Germanic, Old High German, Middle High German to New High German. Internal and external linguistic history of German speech. Prereq: 8 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/NC only, E

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

510 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.

520 Prossemology (3)
Bibliography; methods; illustrative problems; preparation of papers.

521-22 College Teaching of German (1,1)
Required for all M.A. or Ph.D. candidates except those whose previous teaching experience warrants excuse from this requirement or those who wish to pursue vocations other than teaching.

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)

552 German Enlightenment, Rococo and Sturm und Drang (3)

553 German Classicism and Romanticism (3)

554 German Realism and Naturalism (3)

555 Modern German Language 1890-1945 (3)

556 Modern German Language 1945-Present (3)

560 German Literary Theory and Criticism (3)

561-62 Directed Readings in German Language and Literature (3,3)

571-72 Old Norse Language and Literature (3,3)

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

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

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

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

**Russian**

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.)

444-45 Advanced Russian Language and Literature (3,3)

485 Business Russian (3)
Survey of Russian used in fields of business, government, administration and economics. Prereq: 6 hrs of upper division Russian excluding courses in translation and graduate courses.

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

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

510 Russian Phonetics and Advanced Grammar (3)
Advanced work in phonetics, pronunciation, and selected topics in Russian grammar. For teachers and prospective teachers. Prereq: Consent of instructor.

520 Prossemology (3)
Bibliography; methods; illustrative problems; preparation of papers.

521-22 College Teaching of Russian (1,1)
Required for all M.A. or Ph.D. candidates except those whose previous teaching experience warrants excuse from this requirement or those who wish to pursue vocations other than teaching.

541-42 Medieval Russian Language and Literature (3,3)
541—Introduction to Middle Russian; 542—Readings in Medieval Russian Literature.

550 Studies in Russian Literature (3)
Content varies. May be repeated. Maximum 6 hrs.

551 Russian Humanism, Reformation and Baroque (3)

552 Russian Enlightenment, Rococo and Sturm und Drang (3)

553 Russian Classicism and Romanticism (3)

554 Russian Realism and Naturalism (3)

555 Modern Russian Language 1890-1945 (3)

556 Modern Russian Language 1945-Present (3)

560 Russian Literary Theory and Criticism (3)

561-62 Directed Readings in Russian Language and Literature (3,3)

571-72 Old Russian Language and Literature (3,3)

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

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

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

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

610 Russian (3)
Phonology, morphology, and syntax of Russian language. Relationship to Indo-European languages and other Germanic languages. Readings from Russian Bible.

611 Old Russian (3)
Phonology, morphology, and syntax of Old Russian. Representative readings.

612 Old Church Slavonic (3)
Phonology, morphology, and syntax of Old Church Slavonic. Representative readings.

621-22 Seminar in Russian Literature (3,3)
May be repeated. Maximum 18 hrs.

631-32 Seminar in Russian and Germanic Philology (3,3)
Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentrations are available: community health education (accredited by the Council on Education for Public Health), health planning/administration, and occupational/environmental health and safety.

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 one year of professional experience in a related health-related occupation.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 36 semester hours of coursework including 10 weeks of field practice. Field practice provides a full-time affiliation with a public health agency. Field practice offers students the opportunity to develop research skills and problem identification for research in diverse health settings. Development of personal skills for field practice is an essential part of the master's program.

680 Seminar in Health (3) Ramifications of health and health education innovations in relation to evolving field and discipline. Prereq: Advanced standing as doctoral candidate. Sp

Public Health

Graduate study with a major in Public Health leads to the Master of Public Health (M.P.H.). Three professional preparation concentrations are available: community health education (accredited by the Council on Education for Public Health), health planning/administration, and occupational/environmental health and safety.

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 one year of professional experience in a related health-related occupation.

THE MASTER'S PROGRAM

The M.P.H. is a non-thesis program requiring completion of 36 semester hours of coursework including 10 weeks of field practice. Field practice provides a full-time affiliation with a public health agency. Field practice offers students the opportunity to develop research skills and problem identification for research in diverse health settings. Development of personal skills for field practice is an essential part of the master's program.

680 Seminar in Health (3) Ramifications of health and health education innovations in relation to evolving field and discipline. Prereq: Advanced standing as doctoral candidate. Sp
tion of program planning and evaluation techniques. Opportunity to practice skills in a realistic setting. Prereq: G 550 or consent of instructor. Sp


560 Theories and Techniques in Health Planning (4) Overview of health planning concepts and methodologies; systems-constructive 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. Su

568 Physical Activity and Positive Health (3) (Same as Physical Education 568.)

569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) (Same as Physical Education 569.)

580 Special Topics (3) Prereq: Consent of instructor. May be repeated under different topic. Maximum 6 hrs. F

507-88-89 Internship (3,3,3) Internship in either approved organizational or research setting under supervision of designated preceptor. Prereq: MPH major, one semester advance notice and consent of major advisor. S/NC only. E

590 Research Methods in Health (3) (Same as Health 590.)

593 Directed Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

650 Health Aspects of Gerontology (3) (Same as Health 650.)

655 Seminar in Nation's Health (3) (Same as Health 655.)

660 International Health (3) (Same as Health 660.)

Recreation and Leisure Studies

Graduate study with a major in Recreation and Leisure Studies leads to the Master of Science. Professional preparation concentrations are available in therapeutic recreation, general recreation, and sport administration/management. The third concentration is an interdisciplinary program with the department of Physical Education and Dance. The M.S., with thesis and non-thesis options, requires completion of 32 semester hours.

410 Maintenance and Management of Recreation and Sports Related Facilities (3) Principles for operationalizing modern facility maintenance systems and management strategies. Cost tracking, inventory systems, specialized maintenance techniques, safety guidelines, maintenance management systems and security. Prereq: 110, 310 or consent of instructor. F

430 Organization and Administration of Leisure Services (3) Principles of administration applied to provision of leisure services. Application to behavior in non-commercial enterprises. Application to behavior in public, private and commercial enterprises. Organization of personnel, 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 of commercial recreation and tourism. Prereq: 110, junior standing, or consent of instructor. Sp

450 Specialized Study in Leisure Education (1-6) Special interest leisure activities; developing positive attitudes toward leisure. Demonstrates how leisure contributes to mental and physical health. May be repeated. Maximum 6 hrs. E

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

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


515 Philosophical and Conceptual Foundations of Leisure (3) Philosophy of leisure and recreation; nature of philosophy, concepts of leisure, recreation, play, work, and other, history of field, and relationship of ideas to contemporary society and to professional practice. Prereq: Consent of instructor.

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 design and evaluation of leisure delivery systems. Prereq: Consent of instructor. F

521 Leisure Counseling and Facilitation Techniques (3) Investigation of concepts and techniques of leisure counseling; introduction to and practice of various leisure facilitative techniques; use of increased personal leisure awareness as desired but concomitant goal. Prereq: 520 or consent of instructor. Sp

522 Clinical Aspects in Therapeutic Recreation (3) 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. Sp

540 Fiscal Policies for Recreation and Sports Related Organizations and Facilities (3) Application of fiscal policies and procedures to operation of recreation and sports related organizations and facilities. Finance, revenue generating strategies, cash and inventory control, commercial/public cooperative ventures and microcomputer applications. Prereq: 430 or consent of instructor. Sp

590 Graduate Practicum (1-6) Required of all graduate students. 100 clock hrs during semester with agency for 2 hrs credit. Two major phases: work experience and written paper.

591 Directed Study in Leisure & Recreation (1-6) Detailed study of theme, issue, or concern. Designed to meet needs of individual students. May be repeated. Maximum 6 hrs. E

592 Special Topics in Recreation & Leisure Studies (1-6) May be repeated. Maximum 6 hrs. E

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., with thesis and non-thesis options, requires completion of 30 semester hours.

The Specialist in Education (Ed.S.) requires 30 semester hours beyond the M.S.

441 Driver & Traffic Safety Education (3) Preparation of teachers of driver education in schools and colleges. Students are required to teach at least one non-driver. Valid driver's license required. 2 hrs and 2 labs. E

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. E

443 Sports & Recreational Safety (3) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors affecting sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs. E

452 General Safety (3) Principles, practices, and procedures in general accident problems in school, traffic, recreation, industry, home and other public areas. 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 facility time before degree is completed. May not be used toward degree requirements. May be repeated. Sp/NC only. E

532 Behavioral Problems in Safety Education & Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psycholgy 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 in incidence of accidents. F

534 Organization, Administration and Supervision of Safety Programs (3) National, state and local level programs; administrative, institutional, 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 squads. E

572 Graduate Workshop in Safety (3) Special safety education programs. For advanced graduate students, teachers, supervisors, and administrators. May be repeated. Maximum 12 hrs.

580 Special Topics (1-3) Advanced study in selected disciplinary or professional areas of safety education/mangement. May be repeated. Maximum 12 hrs.

593 Directed Independent Study (1-3) Individual identification and study of problem/issue in safety. Extensive reading and critical analysis of safety literature. Specific proposal to instructor before registration. May be repeated. Maximum 12 hrs. E

601 Internship/Research in Safety and Health (3-6) Field experience. Significant problem identified, researched, and reported in acceptable form. May be repeated. Maximum 6 hrs. (Same as Health 601.) E

History

(College of Liberal Arts)

MAJOR

DEGREES

History.................................................. M.A., Ph.D.
John Morrow, Head

Professors:
P. H. Bargeron, Ph.D. Vanderbilt;
E. V. Chmielowski, Ph.D. Harvard;
R. E. Duncan, Ph.D. California (Berkeley);
J. R. Finger, Ph.D. Washington; L. P. Graf (Emeritus) (Distinguished Service Professor), Ph.D. Harvard; A. G. Haas, Ph.D. Chicago; Y. P. Hao, Ph.D. Harvard; R. W. Haskins (Emeritus), Ph.D. California (Berkeley); C. O. Jackson, Ph.D. Emory; M. M. Klein (Emeritus) (Alumni Distinguished Service Professor) Ph.D. Columbia; J. Morrow, Ph.D. Pennsylvania.

Associate Professors:
S. D. Becker, Ph.D. Case-Western Reserve;
J. D. Bing, Ph.D. Indiana; J. Bohstedt, Ph.D. Harvard; C. W. Johnson, Ph.D. Michigan; M. J. McDonald, Ph.D. Pennsylvania;
J. Muldowny (Associate Head), Ph.D. Yale;
P. J. Pinckney, Ph.D. Vanderbilt;

Assistant Professors:
R. Brummett, Ph.D. Chicago; J. R. Farr, Ph.D. Northwestern; W. W. Farris, Ph.D. Harvard;

The Department of History offers graduate study leading to the Master of Arts and Doctor of Philosophy. The M.A. program includes a thesis and non-thesis option and also offers a non-thesis concentration in historic preservation. The doctoral program has concentrations in American or European history with specializations in regional/local American, military/foreign relations, and socioeconomic history. Detailed information may be obtained from the Director of Graduate Studies in History.

All incoming students will be advised by the Director of Graduate Studies.

THE MASTER'S PROGRAM

Admission Requirements
1. Successful completion of a baccalaureate degree, preferably with a major in History.
2. Acceptable scores on the Graduate Record Examination (general and subject history).

Academic Standards
A 3.0 overall GPA is required of graduate students to remain in good standing. The Graduate Awards and Review Committee monitors the progress of all graduate students each semester.

Thesis Option
Twenty-four hours of course work and 6 hours of Thesis 500 for a total of 30 hours are required. The student must complete 510, 3 hours of reading courses (521) and 3 hours of a 600-level seminar. A two-hour oral examination covering both the thesis and the general field in which the thesis is written is given at the end of the program.

Non-Thesis Option
A total of 30 hours of course work is required. A student must complete 510, 6 hours of reading courses (521) and 6 hours of 600-level seminars. A two-hour written examination on one field and a one-hour oral examination on the second field are given at the end of the program.

As many as 3 related hours may be taken in courses outside the department for either option.

Concentration in Historic Preservation
This option is a non-thesis program requiring 33 total hours: 18 hours outside the history department and 15 hours within. Required courses are 6 hours of 521, 3 in historic preservation and 3 in either Early American or Socio-economic history. Students will be examined in two fields: historic preservation and either early American or recent American history.

THE DOCTORAL PROGRAM

Admission Requirements
1. Acceptable scores on the Graduate Record Examination (general and subject history).
2. Successful completion of the M.A.

Residence and Course Work
Students are required to complete a minimum of 50 hours in course work beyond the Bachelor's degree. Students must take 510 or its equivalent. Students transferring from another institution may count up to 24 hours of course work toward the required 50 hours. All students pursuing the Ph.D. must take a minimum 6 related hours outside the department. No fewer than 3 semesters of the 6 semesters of residence work (2 of which must be consecutive) (history) shall be under the supervision of the staff of UTK.

Language Requirements
Candidates must possess a reading knowledge of one foreign language and such additional languages as may be determined by the student's committee. Under normal circumstances, those concentrating in European history will need two languages. The committee may also specify any other research tools, such as statistics, essential for the student's preparation. Upon student petition, the committee may accept in place of a language a B or better performance in an appropriate statistical course and History 526.

The foreign language requirements may be satisfied in one of two ways:
1. By examination. When the student is ready to take a language examination, he/she should consult with an advisor. The appropriate forms and the time of the examination may be obtained from The Graduate School.
2. By course work. Upon consultation with the advisor, a student may elect to complete an appropriate sequence in a language department or an intermediate sequence in a language in which no appropriate sequence is available. Satisfactory completion requires that a student must have at least a B in the final semester.

Comprehensive Examination
The comprehensive examination which will be both written and oral must be taken after all course work is completed, language requirements fulfilled, and at least nine months before the degree is expected. This exam should normally be taken before beginning the sixth semester of work toward the doctorate. The candidate must present two fields, one from group I and one from group II.

Group I
Premodern Europe
Modern Europe
Early American
Recent United States

Group II
Socio-economic
Military/Foreign Relation
Regional/Local (U.S.)
National/Regional (non-U.S.)

Dissertation and Final Examination
Original research forms the basis for the dissertation. After the dissertation has been completed, a final oral examination will be given on the dissertation in its historical context.

500 Thesis (1-15) P/NP only. E.
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E.
510 Foundations to Graduate Study in History (3) Assumptions and methods of historians. Required of all candidates for advanced degrees. F.
533 Topics in European National History (3) Reading seminar: secondary sources on European historical topics, usually British, Russian, German or French. Focus varies. May be repeated. Maximum 15 hrs.
541 Topics in Early American History (3) Reading seminar: secondary sources on early North American history. Focus varies. May be repeated. Maximum 15 hrs.
542 Topics in 19th- and 20th-Century United States (3) Reading seminar: secondary sources on 19th- and 20th-century United States. Focus varies. May be repeated. Maximum 15 hrs.
551 Topics in the History of Foreign Relations (3) Reading seminar: primary sources on foreign relations. Focus varies. May be repeated. Maximum 15 hrs.
552 Topics in Military History (3) Reading seminar: secondary sources on military history, military operations, social impact of war and national strategy in foreign policy. May be repeated. Maximum 15 hrs.
554 Topics in Comparative Social and Economic History (3) Reading seminar: secondary sources on cross-national topics, comparative in nature. 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.

558 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.

566 Topics in U.S. Religious History (3) (Same as Religious Studies 566.)

571 Topics in Applied History (3) Seminar to develop practical skills applicable to museology, historical preservation, and museum administration. Focus varies. May be repeated. Maximum 15 hrs.

580 Topics in History (3) Reading seminar: secondary sources for new topics. Focus varies. May be repeated. Maximum 15 hrs.

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

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

610 Directed Readings (3-15) Directed readings to prepare candidate for doctoral comprehensive examination. May be repeated. Maximum 1 per doctoral field. S/NC only.

611 Seminar in Premodern European History (3) Research seminar in primary sources culminating in scholarly paper in premodern European history. Focus varies. May be repeated. Maximum 15 hrs.

622 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.


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**

M.S.

**THE MASTER'S PROGRAMS**

Students pursuing graduate study in Home Economics Education or Extension are encouraged to enroll in the multidisciplinary Master's degree in Home Economics. Home Economics Education courses (HEED prefix) may be selected to meet requirements of that program. Graduate course work in Home Economics Education may also be selected for development of a concentration or minor within other areas of specialization.

The M.S. in Home Economics is designed to meet graduate study needs of professionals who work in programs encompassing all areas of home economics. Home economics teachers may choose courses within this area for updating and certification renewal. Thesis (33 hours) and non-thesis (36 hours) options are offered. The program includes 3-6 hours in research methodology, 6-9 hours in program planning and implementation (agricultural extension, home economics education, other areas of education), 3 hours in the integrative nature of home economics, and 12-15 (thesis) to 15-18 (non-thesis) hours in home economics subject matter. At least one course is to be from each department in the college. The non-thesis option requires a practicum. An oral/written comprehensive examination will be administered at the end of the program.

510 Curriculum in Home Economics (3) Development of home economics educational materials and instruction. Prereq: 420 or equivalent or consent of instructor. F,A

515 Evaluation in Home Economics Education (3) Assessment of programs and pupil progress; techniques, methods and purposes. Prereq: 420 or equivalent. F,Sp,A

520 Supervision 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 teachers. Prereq: Classroom teaching experience. Su,A

525 Home Economics Adult Education (3) Development and administration of community-based home economics programs for adults. Prereq: Consent of instructor. Sp,A

530 College Teaching in Home Economics (3) Instructional effectiveness, techniques, organization, and evaluation. Prereq: Consent of instructor. F,A

563 Family Life Education Programs (3) (Same as Child & Family Studies 563.)

580 Special Topics in Home Economics Education (1-3) Current issues and trends in home economics. Prereq: Consent of instructor. May be repeated. Su,A

581 Directed Study in Home Economics Education (1-3) Prereq: Consent of instructor. May be repeated. E

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

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

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

**DEGREE**

M.S.

**THE DOCTORAL PROGRAM**

Graduate study leading to the Doctor of Philosophy with a major in Home Ecology is available in the Departments of Child and Family Studies, Nutrition and Food Sciences, and Textiles, Merchandising and Design. Concentrations areas are child development, family studies, food science, nutrition science, and textiles and apparel. A major challenge of the doctoral program in Human Ecology is to draw upon the basic research generated from the natural sciences, social sciences, humanities, and the arts, and to provide a holistic perspective that contributes to the improvement of individual and family well being. For example, the physiological chemist may study metabolic-dietary interrelationships and psychologists may study child behavior. But, it is within human ecology that the nutrient needs of the growing child are considered along with the socio 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.

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);
3. College Professional Seminar in Human Ecology 610;
4. Minimum of 9 semester hours of 600-level course work (not including dissertation);
5. Successful completion of written/oral comprehensive examinations as provided by each department's procedures and the student's doctoral committee;
6. Original research project, which culminates in a dissertation; 24 semester hours of credit are required for dissertation;
7. Final oral examination in defense of the 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 in Fields of Instruction, under the individual academic units that administer the Ph.D. concentrations.

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 anal-
yse software, computer graphics, comput-
er-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 repeat-
ed. S/NC only. E

510 Integrative Nature of Home Economics (3) History and philosophy of home economics. Analysis of cur-
rent programs and future directions in field. Examination of research, integrative framework. F.A

515 Issues and Trends in Human Ecology (1-3) Research and theory related to current issues. Prereq: Consent of instructor. E

520 Directed Study in Human Ecology (1-3) Integrative topics. Prereq: At least 9 hrs of graduate study in college including courses from at least two depart-
ments 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

610 Professional Seminar in Human Ecology (2) Review of various approaches taken by different disciplines to study of ecology; ecological applications in human

ecosystems; model building/systems thinking and futures

analysis software, computer graphics, comput-
er software.

Associate Professors:
J. C. Hungerford, Ph.D. Ohio;
D. H. Hutchinson, Ph.D. Georgia Institute of Technology, K. E. Kirby, Ph.D. Tennessee.

Assistant Professors:
C. H. Alkins, Ph.D. Tennessee, P.E.;
M. K. Goodman, M.S. Tennessee, P.E.

Instructor:
D. F. Jackson, M.S. Tennessee.

Lecturers:
J. A. Bontadelli (Part-time), Ph.D. Ohio State;
S. Douglas (Part-time), Ph.D. Tennessee;
J. C. Mitchell (Part-time) (UTSI), Ph.D. Vanderbilt.

THE MASTER OF SCIENCE PROGRAM

A graduate program leading to the degree of Master of Science is open to graduates of A.B.E.T.-accredited undergraduate curricula in industrial engineering or to graduates of other technical curricula who take prerequisite course work depending on their academic background. These courses will be determined by the graduate committee. The thesis program requires 24 hours of course work and 6 hours of Thesis. A non-thesis option with 30 hours of course work plus a 3-hour design project is available.

Graduate work in Industrial Engineering provides for concentrations in operations research, engineering management, manufacturing systems, human factors engineering, information systems, reliability and quality control, and traditional industrial engineering. Either one or two minors can be elected in engineering, mathematics, psychology, business, computer science, statistics or economics.

Any 400-level course required in the Bachelor of Science in Industrial Engineering program at The University of Tennessee may not be used for graduate credit in the M.S. graduate program in Industrial Engineering.

400 Manufacturing Materials/Processes (3) Characteristics of materials and processes used in modern manufacturing.

401 Integrated Manufacturing Systems (3) NC and CNC machine tools, robotics and related materials handling systems, hard automation, alternative integrated manufacturing systems, and manufacturing information/control systems.

402 Production System Planning and Control (3) Theory and application of forecasting systems, regression and time series models, independent demand inventory models, development of safety stock. Coverage of all modules of Manufacturing Resource Planning (MRP) Systems: master production scheduling, resource requirements planning, bill of material and inventory file structures, material requirements planning capacity planning, shop floor and purchase order control. Overview of just-in-time inventory concepts and MRP's role in manufacturing automation.

403 Production Facilities Design and Material Handling (3) Design of production facilities: plant layout, analysis and planning for overall moving, packaging and storage of materials. Office layout and service areas. Design of facilities for such diverse groups as hospitals, banking, industry. Prereq: 302, 401.

405 Engineering Economy (2) Methods and problems in selection of equipment, facilities, and process design and planning; cost of equipment and processes; capital recovery, economic life of equipment, and rate of return on investment.


412 Quantitative Methods in Project Management (3) Project planning, scheduling, and control based on networked and precedence diagramming methods. Resource allocation and time-cost trade off algorithms. Method 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 production behavior, sampling, single subject experimental designs, classical experimental design methods, and time series models of experimental decay. Validity and reliability concepts as related to measurement and collection of data. Strategies to control and improve hypotheses: randomization, matching, blocking, reduced variables, and extraneous variables into experiments. Selection of appropriate experimental designs for given research situations and data. Prereq: 300 and senior standing, Statistics 251.


415 Informational Systems I (3) Systems engineering approach to design, development, implementation, and evaluation of systems of information. Information systems models and real life database management systems. Prereq: 200 and senior standing.


422 Senior Industrial Engineering Problems Analysis (3) Application of industrial engineering to field assignments in local organizations, problem definition, analysis and presentation. Prereq: 402, 403, and 405.


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

501 Design Project (1-3) Enrollment limited to industrial engineering graduate students in non-thesis program. May be repeated. Maximum 6 hrs. S/NC only.

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

531 Motivational Theories, Systems and Practices in Organizations (3) Application of motivational theories and concepts in use in technology based organizations. Impact of concepts evaluated according to results in various types of organization structures.

532 Productivity and Quality Engineering (3) Productivity and quality measurement, incentive systems, wage and salary quantitative systems: methods analysis, work measurement and evaluation. Prereq: 416.

533 Theory and Practice of Engineering Management I (3) Comparison of classical management principles and theory with environment, needs, and practices of research and development and other scientific-engineering organizations. Cases used to illustrate contemporary problems and environments. Technical management function, marketing of technical services and products.

534 Engineering Management Control Systems (3) Underlying framework of accounting principles and practice reviewed as basis for evaluating productivity costs, requirements for new ventures, changes in strategy, financial condition. Computer data bases examined for control system alternatives.

535 Organizational Behavior and Managerial Decisions (3) Theories of individual and group behavior and their applications to managerial decision making processes. Role of various people categories in managerial decision making processes in normal mode. Case studies used to identify causes of irrational decision, policies, and organizational behavior and to suggest corrective action.

536 Project Management (3) Management and control of multifaceted engineering and technological projects. Coordination and interactions between client and vendor. Measuring and controlling the performance of projects against schedules, cost constraints. Effect of project manager and progress and management, typical problems associated with various phases of life cycle of product. Case studies illustrate theories and concepts.

537 Industrial Engineering Analysis and Control Techniques (3) Survey of management analysis and control systems through IE techniques. Qualitative and quantitative systems: methods analysis, work measurement, incentive systems, wage and salary development, production and inventory control, 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 statistical techniques used to determine financial feasibility of new ventures.

591-92-93 Special Topics in Industrial Engineering (3,3,3) Individual or group research projects. Prereq: Consent of instructor. May be repeated.

601 Operations Research Models in Engineering Economy (3) Mathematical programming techniques applied to capital budgeting; advanced topics in multiple attribute decision analysis; Bayesian analysis of sequential decision processes and optimal sampling plans. Integration of decision theory to determine commercial feasibility of new ventures.


603 Dynamic Programming (3) Solving multi-stage optimization problems as sequence of single-stage optimization problems. Computational and theoretical aspects of planning and decision making under uncertainty and risk. Prereq: 522.

604 Advanced Topics in Optimization (3) Multi-stage optimization theory. Sate inoorum dynamic programming adaptive optimization theory. Prereq: 600.


691-92-93 Advanced Topics in Industrial Engineering (3,3,3) Forum to study individually or in groups. Prereq: Graduate standing and consent of instructor. May be repeated with consent of instructor.

**Journalism**

*Major: Communications*

**Degree: M.S.**

James A. Crook, Director

*Professors:*

P. G. Ashdown, Ph.D. Bowling Green; J. A. Crook, Ph.D. Iowa State; G. A. Everett, Ph.D. Iowa; B. K. Leifer, Ph.D. Southern Illinois; M. W. Singletary, Ph.D. Southern Illinois.

*Associate Professors:*

J. N. Adamson, M.S. Tennessee; M. M. Miller, Ph.D. Michigan State; J. L. Morrow, Ph.D. Toledo; S. L. Puett, M.S. Tennessee.

*Assistant Professors:*

C. E. Cauldill, Ph.D. North Carolina; M. L. Kern-Foxworth, Ph.D. Wisconsin; R. B. Heller, M.A. Syracuse.

*Adjunct Professor:*

Alex Haley

The School of Journalism offers a concentration area for the Master's with a major in Communications. See Communications for additional information.

403 International Communications (3) Development and operations of international communications channels and agencies. Comparative analysis of media, media practices, and flow of news throughout world. Print and broadcast systems in terms of relevance to social, political, economic, and cultural factors. Relation of communication practices to international affairs and understanding. Sp

412 Opinion Writing (3) Analysis of editorial positions, practices, and pages. Writing of editorials and columns for newspapers, magazines, and company publications, rhetorical devices and use of logic. Prereq: Communications 200, or consent of instructor. Sp

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. Fa

416 Issues in Journalism (3) Topics vary. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

420 Print Media Management (3) Current business practice among print news media, especially newspapers. Problems in management and production and outlook for new technologies. Prereq: 6 hrs mathematics and/or accounting and senior standing. Fa


469 Mass Communications History (3) Development of press and role of mass communications in American history. Newspapers, radio, television, and magazines. Sp

470 Public Relations Campaigns (3) Preparation of communications materials to implement planned public relations programs. Preparation of news releases—written and video—and broadcasting copy. Research, planning, communication, and evaluation of major public relations projects and campaigns. Prereq: 203, 270, and senior standing.

480 Journalism in the High School (3) Functions and methods of high school publications. Problems related to layout, copy, photography, printing, advertising, and business. Planning course outlines and curricula for journalism and mass media studies. Su

490 Advanced Photojournalism (3) Advanced principles and methods of black-and-white photography. Introduction to color photography. News and feature photographs and photo essays. Prereq: 290 or consent of instructor.

516 Seminar in Journalism Issues (3) Topics vary. May be repeated. Maximum 6 hrs.


525 Public Opinion (3) Role of press in developing and influencing public consensus. Social theories of public opinion and analysis of mass media's response. Fa

535 Publications Management (3) Problems in management, production, market analysis, and design. Techniques of writing, editing, and presenting comprehensive articles and other materials. Regional and specialized magazines. Individual editorial projects. Prereq: 420 or consent of instructor.

540 Seminar in Newspaper Operations (3) On-site study of newspaper management operations. Positioning medium for its target audience and how this affects profitability. Prereq: 550 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.

580 Seminar in Visual Communication (3) Behavioral aspects of communication with images. Theories of psychological effect in color, shape, texture, and other design elements. Prereq: 203 or Advertising 350 or Broadcasting 430 or equivalent.

590 Communications and International Development (3) Relationship between mass communications and development of nations. Role of communications media of developed nations in "Third World" regions of globe. Communications as facilitator of international understanding. Sp

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

598 Internship (3) Professional work in journalism supervised by editor or manager with faculty approval. No retroactive credit for previous work experience. Prereq: Completion of core curriculum.
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 course work than would be required if two degrees were to be earned separately.

Admissions

Applicants for the J.D.-MBA program must meet separate admission requirements, and be competitively and independently accepted by, the College of Law for the J.D. degree and the Graduate School and College of Business Administration for the MBA degree, and by the Dual Degree Committee. Students who have been accepted by both colleges may commence studies in the dual program at the beginning of any term subsequent to matriculation in both colleges provided, however, that dual program studies must be started prior to entry into the last 28 hours required for the J.D. degree and the last 16 hours required for the MBA degree.

Curriculum

A dual degree candidate must satisfy the graduation requirements of each college. Dual degree students withdrawn from the dual degree program before completion of both degrees will not receive credit toward graduation from either college for courses in the other college, except as such courses qualify for credit without regard to the dual degree program. For students continuing in the dual degree program, the J.D. and MBA degrees will be awarded upon completion of requirements of the dual degree program.

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of 8 semester hours of approved graduate-level courses offered by the College of Business Administration. A student shall receive 2 semester hours of credit for each such course successfully completed unless the Graduate School specifies otherwise. Two of the 8 semester hours must be earned in Accounting 501, 503, or a more advanced accounting course. If College of Law credit is given for such accounting course, the dual degree student may not receive College of Law credit for Legal Accounting (Law College Course 865). The College of Business Administration will award credit toward the MBA for acceptable performance in a maximum of 8 semester hours of approved courses offered by the College of Law. Except while completing the first year courses in the College of Law, students are encouraged to maximize the integrative facets of the dual program by taking courses in both colleges each year.

Awards of Grades

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

Non-Law Elective Course Credit

Students enrolled in the J.D.-MBA degree program may receive credit for graduate courses in other departments of The University of Georgia except for those taken in conjunction with the dual program.

Satisfactory/No Credit Option

A student may take a limited number of elective law courses on a Satisfactory/No Credit basis in the following circumstances:

1. The student has completed 34 semester hours of law work toward the Doctor of Jurisprudence degree;
2. The student is not on academic probation; and
3. The student is not enrolled in any PhD, EdD or other graduate degree program.

The College of Business Administration will award a grade of Satisfactory for any lower grade. The College of Business Administration will award a grade of Satisfactory for a College of Law course in which the student has earned a 2.3 grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used if required by the college for any appropriate purpose in the college offering the course. The official academic record of the student maintained by the Registrar of the University shall show the actual grade assigned by the instructor without conversion.

Law

(Degree of Law)

MAJOR DEGREES

Law .................................................. J.D., J.D.-MBA

Marilyn Yarbrough, Dean

Professors:


Associate Professors:


Assistant Professors:

R. Best, M.L.S. Florida; R. J. Hill, J.D. Tennessee.

Instructor:

M. J. Hoover, J.D. Brooklyn Law School.

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 84 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 hours of credit were earned. Averages are computed on weighted grades. Grades are on a numerical basis from 0.0 to 4.0. A grade of 0.9 or below is a failure.

Eligible law students may receive credit towards a graduate degree in the department offering the course.

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.

Satisfactory/No Credit Option

A student may take a limited number of elective law courses on a Satisfactory/No Credit basis in the following circumstances:

1. The student has completed 34 semester hours of law work toward the Doctor of Jurisprudence degree;
2. The student is not on academic probation; and
3. The election to take a course on an S/NC basis is made prior to the add deadline. The student may not thereafter change the grading option. However, if a student registers for a course on an S/NC basis when he or she is ineligible, the student may request that the grade be changed to a regular grade when the error is discovered.

The number of courses that may be taken on an S/NC basis depends upon whether any graduate-level law-related courses are taken in other parts of the University and applied toward the J.D. Degree. A total of two law courses are applied, then no law electives may be taken on an S/NC basis. Students elected an S/NC basis must meet all requirements imposed on students taking the course on a regular grade basis, e.g., attendance, term paper, recitation, etc. Examinations and other work of students electing an S/NC basis shall not be graded separately or differently from that of other students.

For purposes of S/NC grading, satisfactorily shall mean a grade of at least 2.0. A student electing S/NC who makes 2.0 or above shall receive credit for the course, but the grade shall be recorded as S and will not be used in determining grade average. A student electing Satisfactory/No Credit who makes below 2.0 will receive NC for the course and neither the grade nor the hours of the course will be used in computing grade average or hours credit.

A course taken on an S/NC basis may be used to satisfy satisfactory grades only if a grade of 1.0 is achieved. Required courses may not be taken on an S/NC basis.

Non-law courses must be taken on an S/NC basis and, for the purpose of the limitation on the number of S/NC courses that a
student may take, a non-law course for which credit is received is counted as two-thirds of a course. Thus, a student may take three non-law courses only if no Law College course has been taken on an S/NC basis but may take only one non-law course if one Law College course has been taken on an S/NC basis. A student should be aware that if two non-law courses are taken, no Law College courses may be taken on an S/NC basis.

ACADEMIC STANDARDS
No student will be excluded from the College of Law for academic reasons prior to the completion of two semesters of academic study. A full-time student who fails to achieve a GPA of 2.00 upon completion (receipt of a grade) of two semesters of academic study shall be excluded. Such exclusion shall occur regardless of whether the student has obtained permission to vary the first-year course load.

MAXIMUM COURSE LOAD PER SEMESTER
The maximum course load for a law student is 18 hours in any one semester. During the summer term the maximum course load is 7 hours.

POLICY FOR GRADUATE STUDENTS TAKING LAW COURSES
Law courses are not available for graduate credit; however, a student may be allowed to take up to 6 semester hours of law courses and receive credit toward a degree upon approval of the College of Law and the major chairperson. The graduate student must register for the law course during regular registration at the College of Law requesting an S/NC grade only. If a 2.0 or above is earned in a law course, an S will be recorded on the transcript of at least 2.0. If a student earns below a 2.0, an NC will be recorded, and the course cannot be used toward meeting degree requirements. Grades for law courses will not be reflected in the cumulative average.

Different rules apply to the student enrolled in the Dual J.D.-M.BA Program. Grades must be earned according to the grading system of the respective college. Grades for law courses, letter grades for graduate courses. Refer to page 19 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 cumulatives will be shown on the permanent record.

PROGRAM OF INSTRUCTION
The J.D. program is designed to give the student an adequate preparation for the practice of law. From 12 to 15 hours of classroom work a week are required of all full-time students. The required courses will be taken as early in the law curriculum as possible or as scheduled by the law faculty. Required courses are numbered 801 through 819; elective courses are numbered 820 through 937; seminars are numbered 900 through 937.

PERPECTIVE COURSE REQUIREMENT
One course among the following is required for graduation: American Legal History; Criminal Law Theory; Environmental Law; International Law; Jurisprudence; Law and Economics; Law, Language, and Ethics; Legal Imagination; and Tax Theory.

WRITING REQUIREMENT
One upper-level course in which a substantial legal research paper is written under faculty supervision is required for graduation. This requirement may also be satisfied by a directed research project approved by the Academic Standards Committee, or by a faculty approved comment or perspective written for the Law Review. No single course may be taken to satisfy both the Perspective Course Requirement and the Writing Requirement. These additional required courses may be taken at any time during the second or third year.

LEGAL CLINIC COURSES
Students are eligible to enroll in clinical courses only after the successful completion of their fourth semester (56 semester hours) in addition to meeting other specified prequisites. Students must enroll in only one clinical course per semester and are limited to a total of two courses. Clinical courses are numbered 890 through 895.

801 Civil Procedure I (3) Introductory course; binding effect of judgments; selecting proper court—jurisdiction and venue; ascertaining applicable law; federal and state practice.
802 Civil Procedure II (3) Pleading, joinder of claims and parties; discovery, trials, verdicts, judgments and appeals; emphasis on Federal Rules of Civil Procedure.
803 Constitutional Law (3) Judicial review, limitations on judicial power, national legislative power, regulation of commerce, power to tax and spend; other sources of national power, state power to regulate and tax, intergovernmental immunities; substantive due process; congressional enforcement of civil rights.
804 Contracts I (3) Basic agreement process and legal protection afforded contracts. Problems of offer and acceptance, interpretation, illegality, and statute of limitations.
805 Contracts II (3) Continuation of Contracts I. Remedies, conditions, impossibility and frustration, third party beneficiaries, assignment and delegation, discharge.
806 Criminal Law (3) Substantive aspects of criminal law. General principles applicable to all criminal conduct, specific analysis of particular crimes; substantive defenses to crimes, including insanity, intoxication, mistake, necessity, legal duty, self-defense, and duress.
807 Income Tax I (4) What is income; whose income is it; when is it income; how is it taxed (capital gains and losses, maximum and minimum tax); deductions and credits; rates (corporate, estate, and trust).
808 Legal Process (2) Court structure; case analysis, case synthesis, and use of cases to predict and influence judicial decisions; legislative process; statutory interpretation; influence of judge as policy-maker; adversary system and lawyer's role. Use of legal authority in periodic written exercises.
809 Legal Profession (2) Role of lawyer in society and ethical responsibilities implied in that role; admission to the bar, the organized profession, solicitation, advertising, unauthorized practice, conflicts of interest, decision to represent or withdraw as counsel; fiduciary relationship, advocacy and its limitations, fees, and disciplinary procedures.
810 Legal Bibliography and Research (1) Instruction in legal bibliography, citation form, and research methodology, including computerized research. Identification and location of authorities required to prepare a law office memo, relating to an identifiable legal problem; S/NC only.
811 Legal Writing and Advocacy (2) Legal writing exercises, effective communication of ideas. Preparation of brief and oral argument.

813 Property I (3) Freehold estates, future interests, concurrent ownership, leases; real estate contract and deed; principles of personal property.
814 Property II (3) Recording system, title assurance, easements, nuisance, lateral support, water rights, zoning, and eminent domain.
818 Torts I (3) Intended interference with the person, assault and battery, false imprisonment, negligence, affirmative duties, immunities, actual causation, and contributory causes.
819 Torts II (3) Negligence, result within the risk, or proximate causation. Assumption of risk and contributory fault; interference with property, trespass, conversion, possession; privileges; strict liability, liability of suppliers and contractors; misrepresentation; defamation; unjustifiable litigation; privacy; interference with contractual relations.
820 Administrative Law (3) Administrative agencies and processes; delegation and interpretation of powers; investigatory and rule-making procedures and requirements; adjudicative procedures, evidence, findings, scope of review.
821 Administrative Law I (3) Administrative agencies and processes; delegation and interpretation of powers; investigatory and rule-making procedures and requirements; adjudicative procedures, evidence, findings, scope of review.
822 American Legal History (3) Historical development of law, legal institutions, legal profession, and legal education from colonial times to present; historical relationship of legal system to society.
823 Antitrust (3) Federal antitrust laws; monopolization, price fixing, group boycotts, and anticompetitive practices generally; government enforcement techniques and private treble-damage suits.
824 Bills and Notes (3) Negotiable instruments, negotiability, transfer, holders in due course; equities and defenses; liability of parties; discharge; letters of credit. Arts. 3, 4, and 5 of Uniform Commercial Code.
825 Business Associations (4) Legal forms of cooperative business enterprise; agency; partnership; limited liability; corporation.
826 Business Associations (2) Selected topics. Prereq: 825.
830 Comparative Law (3) General introduction to civil law systems of France and Germany, focusing on legal institutions, methodology and aspects of law of obligations and commercial law.
831 Conflict of Laws (3) Jurisdiction, foreign judgments; choice of law; constitutional limitations, renvoi, and classification.
832 Constitutional Law II (3) Freedom of expression, association and religion; Fourteenth Amendment rights excluding rights of criminally accused, including discrimination to race, sex, etc.; right to franchise and apportionment; concept of state action in matters of civil rights.
833 Copyright, Patent and Trademark (3) Protection for intellectual property under federal and state law; patents, trademarks and trade names, trade secrets, copyright, tax considerations, international aspects.
834 Criminal Law Theory (3) Theoretical foundations of criminal law, including an examination of concepts of justice and morality and pertinent materials in physical and behavioral sciences.
835 Criminal Procedure I (3) Police practices and rights of persons charged with crimes; arrest, search and seizure, identification, interrogation, entrapment, electronic eavesdropping, right to counsel, and jury trial.
836 Criminal Procedure II (3) Pre- and post-trial procedures in a criminal case: bail, preliminary hearing, grand jury, prosecutorial discretion, discovery, speedy trial, plea bargaining, and post-conviction relief.
840 Debtor-Creditor Law (3) Enforcement of judgments; bankruptcy and its alternatives for the business and consumer; emphasis on federal bankruptcy statutes.
841 Decedents' Estates (3) Nature, creation, transfer, termination, and modification of trusts; fiduciary administration; intestate succession; validity, execution, mistake, revocation, probate and contest of wills; advancement and contribution of wills.

842 Directed Research (1-2) Hours to be arranged. Independent study under direct supervision of instructor; maximum of once each year in last two years of study. Proposal must be approved in advance by Academic Standards Committee.

843 Discrimination and the Law (3) Comparison of race, sex and other invidious discriminatory practices as they affect political participation, education, employment, housing and other social and economic activities; emphasis on comparative study of post-Civil War Amendments to the Constitution.

844 Environmental Law and Policy (3) Methods of public policy analysis, framework for understanding responses of legal system to environmental litigation; Clean Air Act, National Environmental Policy Act, and selected regulatory issues.

845 Evidence (4) Rules regulating introduction and exclusion of oral, written, and demonstrative evidence; rules of relevance and evidentiary standards; hearsay, privilege, judicial notice, presumptions, burden of proof.

846 Family Law (3) Survey of laws affecting formal and informal family relationships: premarital disputes, antenuptial contracts, execution, revocation, interpretation of common law and formal marriage, legal effects of marriage, support obligations within family, separate annuities, divorce, alimony, property settlements, child custody, child support, adoption, abortion, and illegitimacy.

847 Federal Courts (3) Jurisdiction of federal courts and conflicts between federal and state judicial systems; inclusion of judicial power, federal questions, diversity, jurisdictional amount, choice of state or federal law, habeas corpus, abstention, execution of state proceedings, appellate jurisdiction, joinder of parties and claims.

848 Future Interests (3) Law of future interests, including reversions, remainders, possibilities of reversion.

851 Government Contracts (3) Principles relating to government procurement, both federal and state; award, performance, and termination of contracts; administrative law and procedures arising under government contracts. Prereq: 820.

852 Income Tax II (3) Partnership taxation; corporate reorganizations and distributions; transactions among corporations and shareholders. Prereq: 807.


854 Public International Law (3) International agreements, organizations, recognition of states, nationality, territory, jurisdiction and immunities, claims, expropriation, force and war.

855 International Business Transactions (3) Legal status of persons abroad, acquisition and use of property within a foreign country, doing business abroad as a foreign corporation, engaging in business within a foreign country, expropriation or annulment of contracts or concessions.

856 Jurisprudence (3) Legal theories: natural law, idealism, historical jurisprudence, utilitarianism, analytical jurisprudence, sociological jurisprudence, legal realism, policy science approach.

860 Labor Law (4) Evolution of labor relations laws, rights of self-organization; employer and union unfair labor practices; strikes, boycotts and picketing, collective bargaining, employee layoffs; collective bargaining, internal union affairs; individual rights in labor relations; employment law, constitutional, federalism and preemption, unions and antitrust laws.

861 Land Finance Law (2) Financing devices: mortgages, deeds of trust and land contracts; problems involved in transfer of interests subject to these devices; problems incurred in event of default; contemporary problems arising in such areas as condominiums, cooperatives, housing subdivisions, and shopping centers.

862 Law and Current Problems (2-3)

863 Law and Economics (3) Relationship between legal and economic thought, use of economics in legal decision making and legal criticism.

864 Law, Language, and Ethics (3) Intermediate level jurisprudence-type course; law as the mind's attempt to deal with the unknown; exploration and analysis of ethical values underlying formal legal reasoning and statement; analysis of judicial reasoning and legal concepts through the prism of biology.

865 Legal Accounting (2) Accounting problems and techniques, use and understanding of accounting information.

866 Legal Imagination (3) Systematic study of literature and its application to accurate, fluent, and creative legal composition.

867 Legal Writing (1) By arrangement. Completion of a potentially publishable Casenote or Comment or Persepective for the Tennessee Law Review or participation as a member of a faculty supervised moot court competition.

868 Legislation (3) Interpretation and drafting of statutes, legislative process, and legislative power; judicial views on legislative process subjected to critical comparison with other institutions and processes and applicable constitutional principles.

869 Local Government (3) Distribution of power between state and local governmental units; sources of authority for local governmental operations; creation of local governmental units and determination of their boundaries; home rule; problems represented by fragmentation of local government units; problems in financing of local services; influence of federal programs on local government finance and decision making.

872 Modern Land Use Law (2) Land use planning, nuisance, zoning, eminent domain.

873 Natural Resources Law (3) Selected materials on nature of interest, conveying, royalties, grants and reservations, leases, and taxation.

874 Products Liability (3) Negligence of manufacturer or seller; strict liability of manufacturer; liability of retailer and other suppliers; defectiveness and causation; disclaimer and contributory fault.

875 Remedies (4) Judicial remedies: damages, restitution, and equitable relief; consideration of availability, limitations, and effectiveness of remedies; comparative evaluation of remedies available in various situations.

876 Selected Problems in Remedies (3) Course content varies. Topics may include complex litigation (class actions and/or derivative suits), problems in restitution. Prereq: 875 or consent of instructor.

877 Security Interests (3) Art. 9 (Security Interests in Personal Property) of the Uniform Commercial Code and Art. 7 (Documents of Title) of the Uniform Commercial Code.

880 Sales and Secured Transactions (4) Art. 2 (Sales) and Art. 9 (Security Interests in Personal Property) of the Uniform Commercial Code.

881 Securities Regulation (3) Advanced problems of governmental regulation of issuance of securities.

882 Social Legislation (3) Schemes other than traditional tort law for compensating victims of accidents, disability and other maloccurrences; Workers Compensation and no-fault systems of compensation; Social Security disability benefits and administrative procedures for resolving such claims. Brief survey of medical assistance, welfare, related matters.

883 Tax Theory (3) Comparative study of methods and purposes of governmental revenue collection through examination of economic theory and various actual proposed schemes of taxation. Prereq: 807.

884 Trial Practice (3) Criminal and civil litigation: trial preparation; topics; civil rights injunctions, remedies in complex litigation (class actions and/or derivative suits), opening and closing arguments.

885 Wealth Transfer Taxation (3) Transfers of wealth at death (estate tax) and during life (gift tax); generation skipping transfers; deductions and credits; inter-relationship of transfer taxation. Prereq: 807.

889-91 Introduction to Advocacy (4-8) Litigation, trial problems and practices; basic trial strategies; discovery, presentation of evidence, voir dire, jury instructions, and opening and closing statements; construction and presentation of representation of actual clients; ethical issues during supervised fieldwork and selected problems of professional responsibility. Select civil or criminal component. After successful completion of one component, student may enroll for second component in subsequent semesters. 889—Civil Component; nature, function, dynamics and processes of lawyering and learning, development of frameworks and models useful in evaluating roles in legal system; intensive supervised fieldwork experience, representation of clients with legal problems in civil area. Prereq: 845, 801, and 802. 891—Criminal Component: criminal justice and advocate's role as defense counsel; Supervised fieldwork, criminal defense representation in preliminary hearings and misdemeanor trials in general sessions court. Prereq: 845, 806, 853, and 838.


895 Economic Development (4-5) Models and skills pertaining to representation of corporations and businesses; public policy analysis, framework for understanding responses of legal system to economic development; governmental regulation of issuance of securities.

901 Administrative Law Seminar (2) Principles of administrative law. Discretion, choice of adjudication or rulemaking to develop administrative policy, consistency in administrative action.

902 Arbitration Seminar (2) Arbitration of labor disputes; judicial and legislative developments, nature of process, relationships to collective bargaining, selected arbitration problems on various topics under collective agreements, and role of lawyers and arbitrators in the process.

905 Business Planning Seminar (2) Selected problems in corporate and tax aspects of business planning and transactions. Prereq: 852, 825.

907 Commercial Law Seminar (2) Content varies. Preliminary seminar for students enrolled in complexes on selected problems in commercial transactions; major research paper. Prereq: 880.

909 Constitutional Law Seminar (2) Current constitutional law problems; original paper required. Prereq: 807.

911 Consumer Protection Seminar (3) Selected problems in consumer protection.

913 Criminal Law Seminar (2) Advanced problems in criminal law and administration of justice.
915 Environmental Protection Seminar (2) Problems of \ formatating \ of defense in environment and mobilizing public and\ personal \ of environment. Problems of proving environmental impact of selected projects, interpretation and evaluation of scientific data, use of expert witnesses. Special environmental concerns of region, e.g., TVA operations, strip mining, forest management, wildlife preserves. Team-taught and selected experts. Prereq: 844.

917 Estate Planning Seminar (2) Problems of estate planning both inter vivos and testamentary; advantages and disadvantages of various types of ownership; law and practice of fiduciary administration, insurance, wills, future interests, trusts, corporations, partnerships, and gifts as related to estate planning; research on assigned topics; drafting of estate plan for hypothetical fact situations. Prereq: 841 and 885.

919 International Law Seminar (2) Current international law problems; paper required. Prereq: 854.

921 Juvenile Law Seminar (2) Unique history and philosophy of juvenile justice system; jurisdiction, judicial and extrajudicial functions of juvenile court, and various dispositional alternatives; judicial options and materials from fields of history, sociology, and psychology. Knox County Juvenile Court serves as laboratory for students; professional staff from the Court participate in seminar on regular basis.

923 Labor Relations Law Seminar (2) Selected labor relations law problems.

925 Land Acquisition & Development Seminar (2) Alternative business forms and major documents (notes, deeds, grants); examination of acquisition or development of large pieces of raw land prepared and presented for seminar discussion. Prereq: 881.

927 Law and Current Problems Seminar (2-3)

929 Law and Medicine Seminar (2) Medical professionals' involvement in judicial process; medical malpractice and alternatives to fault-based liability; responsibilities for disposition and care of dead bodies and organ transplantation; expert medical proof and testimony; medical aspects of euthanasia; legal import of medical profession's various canons of ethics.

931 Law and Mental Health Seminar (2) Psychiatric principles, roles of psychiatrist, and relationship to role of legal counsel; assigned readings; field work in mental health clinic; joint taught by law professor and psychiatrist.

933 Office Practice Seminar (2) Techniques of law office management, methods and practice; techniques in preparation of various legal instruments, office correspondence, interviewing and counseling, management of personnel.

935 Seminar in the Professional Competence of the Lawyer (2) Typical situations in which malpractice claims arise: third party claims, conflicts of interest, breach of fiduciary duties; examination of difficult problems of proof including use of expert testimony.

937 Trade Regulation Seminar (2) Antitrust laws and problems of proof including use of expert testimony; medico-legal aspects of euthanasia; legal import of medical profession's various canons of ethics.

939 Land Acquisition & Development Seminar (2) Alternative business forms and major documents (notes, deeds, grants); examination of acquisition or development of large pieces of raw land prepared and presented for seminar discussion. Prereq: 881.

530 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 19th century. Sp

475 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 475.)

500 Thesis (1-5) F/NP only. E

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

510 Information Professionals and Their Organizations (3) Variety and prospects of information professionals; professional organizations: achievements, responsibilities, goals, and issues. E, Su, A

520 Technical Services I (3) Technical services principles and techniques: acquisitions, basic manual and automated cataloging, structure and use of library catalogs, basic subject organization and indexing. E, Su, A

521 Technical Services II (3) Library of Congress subject organization and description, automated cataloging and cataloging of serials and more difficult materials. Prereq: 520. Sp

530 Information Sources and Services (3) Basic bibliographic and information sources, online databases. Interview and search techniques, selection and evaluation of Department of Library and Information Science, allowing up to 9 hours outside the school with a maximum of 6 from outside the University. Upon completion of the program, all students are subject to a final examination. For students who elect the thesis option, the examination will be a defense of the thesis. Students who elect the non-thesis option will be given a written comprehensive examination.

FINANCIAL ASSISTANCE OPPORTUNITIES

Employment with The University of Tennessee Libraries may provide a work-study opportunity for selected students who wish to obtain experience in academic librarianship while pursuing the degree. Such students usually work at least 20 hours each week and thus may extend the period required for the degree. Similar opportunities exist with some of the other libraries and information agencies in the Knoxville area.

Work opportunities in a scientific-technical environment are available through subcontracts with Oak Ridge National Laboratory and the Department of Energy. A limited number of graduate assistantships are available through the school.

Assistantships of this type carry a waiver of tuition and fees as well as a stipend and require that recipients work 10 hours per week.

The program is listed in the Academic Common Market of the Southern Regional Education Board. Students residing in Arkansas, Georgia, West Virginia, or Virginia can normally qualify for in-state fee status by applying to the Academic Common Market coordinators in their state capitals.

For application forms and information about financial aid and other information about the MLS in Library and Information Science, write to:

Ann E. Prentice, Director
Graduate School of Library and Information Science
University of Tennessee
804 Volunteer Blvd.
Knoxville, TN 37996-4330

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. F,Su

552 Academic Libraries (3) Development and present status, mission and objectives within higher education institutions, trends, problems, recurring issues. F

553 Special Libraries and Information Agencies (3) Development and present status, scope and objectives, administrative and organizational problems and techniques. F

554 The Library in the Community (3) Application of marketing analysis for planning and policy formulation. Public library focus. Sp

560 Development and Management of Collections (3) Philosophy and process of building and managing collections in libraries and information agencies; environment; community analysis; policy statements; collection evaluation; and preparation of buying lists. Prereq: 530. E,Su,A

561 Contemporary Book Publishing (3) Creation, design, production, marketing, and distribution of materials acquired by libraries; various types of publishers. F

562 Serials (3) Serials collections: selection, acquisition, bibliographic control, storage, maintenance, and public service. Prereq: 560 or consent of instructor. Sp

563 Nonbook Materials (3) Selection, acquisition, multimedia representation, storage, utilization, and programming; microforms, films, video, sound recordings, and as information media. F

564 Records Management and Archival Program (3) Objectives and functional elements of records management and archival programs within various types of organizations, management of creation, distribution, retention, storage, retrieval, protection, and disposition of organizational records regardless of information medium. Sp

569 Advanced Production of Audiosoftware (S) (Same as Curriculum and Instruction 569.)

571 Resources for Children (3) Critical survey of books and related materials for children, development of genres, evaluation, selection, and utilization for school and public libraries. 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 services of public and school library services for children and young adults. Reading, listening, and viewing guidance for individuals and groups. Program planning, implementation, and evaluation. Prereq: 571 or 572 or consent of instructor. Su

574 Adult Materials and Services (3) Fiction and subject categories, popular and standard; reading, listening, and viewing guidance to meet adult interests; development of specialized collections; services for adults. F

580 Foundations of Information Science (3) Identifies attributes of information; information theory, relevance, use and user studies, bibliometrics, and major components of information retrieval system design. 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, effect of technological innovation, use and effect of media. F

582 Automation (3) Computer concepts and their applications to basic library and information center operations. E,Su,A

583 Information Systems Analysis and Design (3) Tools and methodologies in library/information agency systems planning and implementation. Role and training of systems analyst, system study from planning through implementation and evaluation, and related topics. Sp

584 Bibliographic Database Design (3) Design and construction of bibliographic databases, record and database structure, document representation, indexing, abstracting, thesaurus construction and maintenance, and information retrieval. Sp

585 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and external to library/information center environment; existing and prototype systems and interfacing of technologies. Prereq: 582 or consent 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.

599 Practicum (3) Opportunity to translate theory into practice under guidance of qualified information professional. Prereq: Completion of courses relevant to student’s practicum design. Written consent of advisor and approval of practicum coordinator. May be repeated with consent of advisor and practicum coordinator. E,Su

Life Sciences

(Office of the Provost)

MAJOR DEGREES

Life Sciences

Coordinating Council:

H. I. Adler (Chair); Physiology: R. Bagby; Biotechnology: D. K. Dougall; Cellular, Molecular, and Developmental Biology: J. M. Becker; Environmental Toxicology: W. R. Forkas; Ethology: G. B. Burghardt; Plant Physiology and Genetics: O. J. Schwarz.

The programs leading to the M.S. and Ph.D. degrees in Life Sciences are interdepartmental and intercollegiate programs which augment the programs of individual departments.

The Life Sciences Council supports studies and research in the following concentrations: physiology, biotechnology (M.S. only); cellular, molecular and developmental biology; environmental toxicology; ethology; and plant physiology and genetics. Students interested in any of these areas should contact either the chair of Life Sciences or the director of the area of interest. Each program is overseen by a committee and may have unique admission and graduation requirements.

ADMISSION REQUIREMENTS

1. A Bachelor's degree with a major in a biological, behavioral, or physical science.
2. GRE (general) scores.
3. Three letters of recommendation.
4. Course work 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 660, 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 in the first year; by further formal study of aspects of biotechnology in the second year; 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 509, 511, 512, 531, 532: Biochemistry 511; Microbiology 410; Botany 451; Chemical Engineering 475; and Zoology 507.

Cellular, Molecular, and Developmental Biology

The interdepartmental program in cellular, molecular, and developmental biology includes research in structural or functional aspects of cells or subcellular components, or the interactions between cells. Required courses are Life Sciences 511, 512, 531, and 532.
Environmental Toxicology
The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose students to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.

Required courses are Biochemistry 551, 552, 604; and Life Sciences 510.

Ethology
Ethology is the naturalist study of normally occurring animal and human behavior. The program provides intensive training in basic ethology with specialized studies available in the development, evolution, and physiology of behavior; 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 the student's committee.

Physiology
The inter-departmental program in physiology includes research in the areas of cellular, comparative, developmental, exercise, muscle, neuro-physiology, regulatory, or reproductive.

Required courses are Zoology 520, 521, 240, 350, 420; Biochemistry 410; four 600-level semesters; and a statistics sequence.

Plant Physiology and Genetics
This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions to 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 551, 571; Microbiology 410.

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

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

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 structures and functions at molecular and supramolecular level. Membrane structure, function, and biogenesis; cellular communication; receptors and membrane flow, growth regulation and oncogenes; plant cell structure and function; contractility and motility; mitosis and meiosis; blood and immune cells.

512 Advanced Molecular Biology (3) (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.

528 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 6 hrs.

Logistics
See Marketing, Logistics and Transportation Management

MAJOR DEGREES
Management
(College of Business Administration)

MAJOR BUSINESS Administration.............MBA, Ph.D.

Ronald W. Boling, Acting Chair

Professors:
R. W. Boling, Ph.D. Stanford; H. D. Dewhurst, Ph.D. Texas; M. E. Gordon (Alumni Distinguished Service Professor), Ph.D. Pennsylvania; A. H. Kealy (Emeritus), MBA Pennsylvania; J. M. Larsen, Jr., Ph.D. Purdue; C. J. Neel, Ph.D. Alabama; S. K. Reed, Ph.D. Edinburgh; D. Reese (Emeritus), Ph.D. Iowa; E. R. Smith, Ph.D. Ohio; C. S. Vance (Emeritus) (William B. Stokely Professor of Strategic Management), Ph.D. Pennsylvania; G. A. Wagener (Emeritus), Ph.D. Missouri; M. S. Worman, Jr., (William B. Stokely Professor of Strategic Management), Ph.D. Minnesota.

Associate Professors:
O. S. Fowler, Ph.D. Georgia; K. C. Gilbert, Ph.D. Tennessee; R. T. Ladd, Ph.D. Georgia; R. C. Maddox, Ph.D. Texas; M. C. Rush, Ph.D. Akron.

Assistant Professors:

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

MBA Concentrations
Management
Minimum Course Requirements for MBA Concentrations: Management—Three courses from the following: 511, 513, 521, 511, 541, 542, 551, 571, 593. Selection must be approved by the Management Department MBA advisor. Management—511, 513, Forestry 560, 565.
Ph.D. in Business Administration
Concentration
Management (Operations Management and Strategic Management)
Minimum Course Requirements for Ph.D. Concentration: Operations Management—541 and 542; two semesters of 640 (may be repeated for credit); one additional semester of approved doctoral seminar work; Strategic Management—513, 610, 611, 612.

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

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

504 Management of Organizational Behavior (3) Integration of individual and group differences, organization theory and design, motivation, leadership, human resources planning, and career implications with strategy, planning, and decision making.

505 Operations and Logistics Management (3) Concepts and techniques for managing operations and distribution systems. (Same as Transportation 505.)

511 Organizational Theory: Integrated Structure and Behavior (3) Cases, group projects, discussion; organizational theories, organizational effectiveness; contextual factors of organizations; environment, size, technology, organizational structure configurations, organization design; social influences on organizational effectiveness; management, group behavior, intergroup relations, organization change and development.

513 Strategic Planning (3) Theoretical and applied literature, successful strategic positioning of business in variety of environments. Analysis of industry notes and case histories. Coreq: Business Administration 509.

521 Personnel Administration (3) Personnel functions and human resources management. Community relations, recruiting, selection, training, performance evaluation, wage and salary administration, legal framework as it affects personnel.

522 Labor Relations and Collective Bargaining (3) American labor history, strike, labor legislation, philosophy of bargaining, dispute settlement, and contract administration. (Same as Economics 582.)

525-26 Industrial and Organizational Psychology (1-3, 1-3) Readings in industrial and organizational psychology. Available only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

531 Management of Technology-Based Organizations (3) Role of technology and innovation in formulation and implementation of strategy. Management of research and development function and coordination with other functions. Management of scientists and engineers.

541 Operations Management (3) Techniques applicable to design of systems in operations function.
Management Science

(College of Business Administration and Intercollegiate Program)

MAJORS

Management Science.................M.S., Ph.D.
Business Administration.............MBA

Kenneth C. Gilbert, Chair

Professor:
J. K. Ho, Ph.D. Stanford.

Associate Professor:
K. C. Gilbert, Ph.D. Tennessee.

Assistant Professor:
D. R. Fox, Ph.D. Purdue University.

Master's Committee:

Doctoral Committee:

THE MASTER'S PROGRAM

The Master's program in Management Science is an intercollegiate program and is designed as preparation for a career in the application of quantitative techniques for the solution of complex problems. The program's flexibility also makes it appropriate as preparation for doctoral study in Management Science.

Management Science course work 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 M.S. program in Management Science requires three Graduate School Rating Forms and the GRE or GMAT. Applications are encouraged from all majors, but mathematics background equivalent of the completion of at least two years of college calculus and proficiency in a computer language is required. The program is designed to be completed in three semesters by full-time students. However, students may start the program in any semester and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

Hours
Core Requirements.................14
Management Science 531, 532, 533, 534
Statistics 563
Applied specialization area...........9
(approved by advisor)
Statistics elective—500 level or above (approved by advisor)
Mathematics—400 level or above (approved by advisor)
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 8 hours of course work: 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 course work, 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, management, and transportation and logistics) or other disciplines, (e.g., computer science, forestry, ecology, and public administration);
3. to develop in the student, through course work in mathematics, statistics and...
computer science, a high degree of mathematical maturity to enhance a potential career in management, research, or teaching.

**Admission and Degree Requirements**

The doctoral program requires three Graduate School Rating Forms and the GRE or GMAT. General University requirements for the doctoral degree are stated on page 22.

**Course Work**

A minimum of 48 semester hours of course work taken for graduate credit (exclusive of thesis or dissertation) is required. Some of this may be the course work 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 course work in the applied area.

**Qualifying Examinations**

The student must demonstrate mastery of probability theory and statistical inference, Statistics 583, 564, by passing a written qualifying examination. Mastery of 12 to 14 semester hours in mathematics course work must be demonstrated by passing a written qualifying examination. Topics normally include numerical analysis, either Mathematics 471, 472, 453, and 571, or 571-572, and real analysis, Mathematics 445-446. Other options may be approved. In exceptional circumstances, the faculty will consider waiving the mathematics and/or statistics qualifying examinations. These requirements generally are completed by the end of the first year of the program.

There is no foreign language requirement.

**Comprehensive Examination**

Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

**Research and Dissertation**

The student must complete 24 semester hours of Management Science 600. Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and each such segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 48 hours of course work, normally is completed in the third year of the program.

**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 course work 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**

For students whose MBA concentration area is Management Science, the MBA Core is revised as follows: substitute Management Science 531 for 501, Statistics 563 for 501, and with approval of student’s advisor, substitute Statistics 564 for 501. The concentration area must include Management Science 532 and 534.

500 Thesis (1-15) P/NP only. E
501 Quantitative Analysis for Management Decisions (3) Assignment, transportation and general linear programming problems; decision theory, Markov chains and queuing. PreReq or coreq: Statistics 501. Not available for students with credit for 531.
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
533 Computational Mathematical Programming (3) Advanced modeling, computational and reporting techniques in practical mathematical programming. PreReq: 531 and proficiency in PASCAL.
534 Application of Management Science Methods (3) Application of methods from 531 and 532 to real world problems. Exposure to existing problem in industry or elsewhere.
581 Special Topics in Management Science (3) PreReq: Consent of instructor. May be repeated. Maximum 9 hrs.
593 Management Science Problems (1-6) Directed study on subject of mutual interest.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
621 Network Flows (3) Treatment of network optimization algorithms, transportation and transshipment models and primal-dual and primal-basis tree methods. PreReq: 531 or equivalent.
631 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group theoretical algorithms. PreReq: 531 or equivalent.
651 Nonlinear Optimization (3) Solution of constrained and unconstrained nonlinear programming problems. Practical algorithms that perform well in recent practice. PreReq: 531 or equivalent.
681 Special Topics (3) PreReq: 531, 532 and consent of instructor. May be repeated. Maximum 9 hrs.
691-92 Management Science Seminar (1,1) Subjects selected from current literature.

**Marketing, Logistics and Transportation**

(Continued from College of Business Administration)

**MAJOR DEGREES**

Business Administration..................... MBA, Ph.D.

David J. Barnaby, Chair

**Marketing**

Professors:

D. J. Barnaby, Ph.D. Purdue; E. R. Cadotte, Ph.D. Ohio State; R. L. Jenkins, Ph.D. Ohio State; W. B. Locander, Ph.D. Illinois; R. B. Woodruff, D.B.A. Indiana.

Associate Professors:

J. R. McMillan, Ph.D. Ohio State; R. C. Reizenstein, Ph.D. Cornell; J. O. Rentz, Ph.D. Georgia.

Assistant Professors:

D. J. Faulds, Ph.D. Iowa; S. F. Gardial, Ph.D. Houston; D. W. Schumann, Ph.D. Missouri (Columbia); P. S. Speck, Ph.D. Texas Tech.

**BUSINESS ADMINISTRATION CONCENTRATIONS**

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

**MBA Concentration**

Marketing

Minimum Course Requirements for MBA Concentration: Three courses from the following: 503, 504, 505, 506, 550, 593, 599, Transportation 507, Business Administration 599.
601 Seminar in Logistics and Transportation Models (3) Analysis of contemporary models and methodologies in logistics and transportation research, topical coverage at discretion of instructor.

602 Seminar in Macrotransportation Systems (3) Contemporary national logistics and transportation systems, governmental policies in logistics and transportation sector, and current literature and research in field.

603 Research Methodology in Logistics and Transportation (3) Fundamental research process in areas of logistics and transportation, history and development of body of knowledge, and contemporary research methodology to develop student dissertation topics.

Materials Science and Engineering (College of Engineering)

MAJORS

DEGREES

Metallurgical Engineering
Polymer Engineering

Joseph E. Spruill, Head

Professors:
K. H. G. Ashbee, Ph.D. Birmingham (England); C. D. Bogue, Ph.D. Delaware; B. S. Borie, Ph.D. Massachusetts Institute of Technology; C. R. Brooks, Ph.D. Pennsylvania; R. A. Buchanan, Ph.D. Vanderbilt; E. S. Clark, Ph.D. California (Berkeley); D. A. Canonico, Ph.D. Lehigh; F. Fellers, Ph.D. Akron; J. S. Lin, Ph.D. Kansas; C. D. Lundin, Ph.D. Rensselaer Polytechnic Institute; C. J. MChargue, Ph.D. Kentucky; B. F. Oliver, Ph.D. Pennsylvania State; P. J. Phillips, Ph.D. Liverpool (England); J. E. Spruill, Ph.D. Tennessee; E. E. Stansbury (Emeritus), Ph.D. Cincinnati.

Associate Professors:
W. T. Becker, Ph.D. Illinois; J. Bentley, Ph.D. University of Salford (England); D. M. Krogser, Ph.D. Vanderbilt; C. T. Liu, Ph.D. Brown University; T. T. Meek, Ph.D. Ohio State; A. J. Pedraza, Ph.D. National University (Argentina); C. L. White, Ph.D. Michigan Tech. University.

Assistant Professor:
R. S. Benson, Ph.D. Florida State.

Lecturer:
George D. Wignall, Ph.D. Sheffield (England).

Graduate programs are offered leading to the degrees of Master of Science and Doctor of Philosophy in Metallurgical Engineering or Polymer Engineering. Both the metallurgical
and polymer programs are flexible and interdisciplinary in nature. Students may be admitted from a wide range of disciplines; these include physics, chemistry, chemical engineering, mechanical engineering, electrical engineering, materials engineering, and engineering science programs. Prospective students should consult materials science and engineering faculty concerning development of individual concentrations or special programs compatible with their backgrounds and goals.

Areas of concentration within the metallurgical engineering program include physical metallurgy; materials processing; welding metallurgy and materials joining; corrosion behavior; failure analysis; and mechanical and physical behavior of materials. Specializations in electronic and ceramic materials are available.

Areas of concentration within the polymer engineering program include rheology and polymer processing; polymer morphology; mechanical, physical and chemical behavior of polymers; and composite materials.

THE MASTER’S PROGRAM

Departmental requirements include the satisfactory completion of:

1. A major consisting of 12 to 18 semester hours of graduate courses in metallurgical engineering and polymer engineering. The Polymer Engineering major must include Polymer Engineering 511, 512, 541, 551-2. (Substitutions may be acceptable for students with significant experience in polymer research.)

2. One or two minors or cognate work, 6 to 12 hours total in engineering, chemistry, mathematics, physics, or other related fields.


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

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.

Departmental requirements consist of the satisfactory completion of:

1. Graduate courses in materials science and engineering, metallurgical engineering, or polymer engineering amounting to approximately 24 semester hours, at least 8 of which must be in 600 series courses.

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

3. The comprehensive examination, usually given in two parts, and covering such topics as materials science and engineering, metallurgical or polymer engineering operations and processes, thermodynamics, technical physics, thermodynamics, physics, chemistry, and other related fields.

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

Materials Science and Engineering

414 Corrosion Science and Engineering (3) Mechanisms and control of corrosion and degradation processes; thermodynamics and electrode kinetics of corrosion reactions; electrochemical measurement techniques; applications to design. Prereq: 201 or equivalent.

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 completion is made. May not be used toward degree requirements. May be repeated. E/S/NC only. E

505 Engineering Analysis (3) (Same as Chemical Engineering 565.)

521 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: Metallurgical Engineering 303 or equivalent.

541 Electron Microscopy (3) Operation of electron microscope; kinematical and dynamical diffraction theories; structure determination; analysis of lattice defects. Prereq: 331 or equivalent.

551 X-Ray Diffraction (3) Symmetry of crystals, space group theory, reciprocal lattice and application to definition of structures; powder and single crystal x-ray techniques; introduction to crystal structure determination; characterization of orientation; application to inorganic, metallic and polymer structures.

552 Biomaterials Analysis and Development (3) Physical-property limitations of current surgical implant materials and methods of improvement; resistance to corrosion and mechanical damage; stress rupture; effects of specific metal ions; development of new biomaterials and new materials processing techniques. Prereq: 315, 414 or consent of instructor.

562 Formability 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.

Metallurgical Engineering

411 Materials Process Design (3) Property control through composition, thermal and mechanical processing of material, structure, and phase transformations; high-temperature oxidation and the role of secondary 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: Materials Science and Engineering 414 or consent of instructor.

414 Corrosion Science and Engineering (3) Mechanisms and control of corrosion and degradation processes; thermodynamics and electrode kinetics of corrosion reactions; electrochemical measurement techniques; applications to design. Prereq: 201 or equivalent.

421 Fabrication (3) Principles and processes of welding, casting and powder metallurgy, solidification, segregation, heat flow, microstructure, residual stresses, thermal treatments, sintering, non-destructive testing. Prereq: 301, 302. 3 hrs or 2 hrs and 1 lab. F

422 Chemical Process Metallurgy (3) Application of chemical thermodynamics to metallurgical processing. Ferrrous and nonferrous pyrometallurgical refining, slagmetal equilibria, solidification, gas-metal processing. Prereq: 303, 302. 3 hrs or 2 hrs and 1 lab. F

431 Mechanical Metallurgy I (3) Mechanical properties from tensile to elastic behavior, description of stress, strain, and stress-strain relations; plane stress and plane strain loading; failure by yield; stress concentration; brittle fracture due to loading rate and to past and flaw geometry. Prereq: Materials Science and Engineering 201, and Engineering Science and Mechanics 321. F

432 Mechanical Metallurgy II (3) Brittle fracture due to metallurgical and environmental factors; stress-life and strain-life fatigue analysis; residual stresses; creep and stress rupture; finite plastic strain, ductile fracture and tearing; notch sensitivity, necking, strain forming; formability testing. Prereq: 431; or Mechanical Engineering 489 and Materials Science and Engineering 201 or equivalent. Sp

451 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 423.)

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

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

511 Defects in Crystals (3) Analytical and experimental analysis of defect interactions in solids. Prereq: 431 or consent of instructor.

512 Plastic Deformation (3) Geometry and mechanisms of single crystal plastic deformation; slip, twinning, and cleavage, work hardening, effect of temperature, loading rate effects; effect of ordering and solid solution alloying; polycrystalline behavior in terms of single crystal deformation mechanisms; texture formation. Prereq: 301, 302 or consent of instructor.

522 Metallurgical Thermodynamics (3) Applications of chemical thermodynamics to metallurgical problems: refining, oxidation, surface treatments, alloy systems. Prereq: Materials Science and Engineering 521 or equivalent.

531-32 Welding Metallurgy (3.3) Welding processes; physical metallurgy of welding; phase transformations; heat flow; residual stresses; theories of hot cracking, cold cracking and porosity formation; applications to process utilization.

541 Diffusion in Solids (3) Phenomenology and atomic mechanisms of diffusion in solid state. Solution and applications of diffusion equations; random walk problem and mechanisms of diffusion; diffusion in dilute and concentrated alloys; Kirkendall effect; high diffusivity paths.

542 Phase Transformations (3) Thermodynamics of phase equilibrium, theory of nucleation in solids; kinetics and morphology of diffusion controlled growth; kinetics of interface controlled phase transformations; crystallography and kinetics of martensitic transformations.

551 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: Materials Science and Engineering 414 or consent of instructor.


591-92 Special Topics in Metallurgical Engineering (3.3) Recent advances in metallurgical engineering. Prereq: Consent of instructor. May be repeated.

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

611-12 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.

621-22 Solidification and Crystal Growth (3.3) Theories of solidification, fluid flow effects, magnetohydrodynamics and kinetics of immiscible fluids, growth stability theory, thermodynamic applications, rapid solidification theory, metastability, 622-seminar format. Prereq: Consent of instructor.

631 Advanced X-Ray Diffraction (3) Kinematical and dynamical theory; crystal structure determination; thermal motion; lattice faults, diffuse scattering. Prereq: Materials Science and Engineering 551.

641 Seminar in Recent Advances in Metallurgical Engineering (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Polymer Engineering

494 Introduction to Polymer Science and Engineering (3) Basic course on polymers, Methods of synthesis;
Mathematics (College of Liberal Arts)

MAJOR
Mathematics .................. M.M., M.S., Ph.D.

John S. Bradley, Head

Professors:
G. E. Albert (Emeritus), Ph.D. Wisconsin; J. S. Bradley, Ph.D. Iowa; J. H. Carruth, Ph.D. Louisiana State; C. E. Clark, Ph.D. Louisiana State; R. E. Cline, Ph.D. Purdue; R. J. Daverman, Ph.D. Wisconsin; D. J. Dessart, Ph.D. Maryland; D. E. Dobbs, Ph.D. Cornell; E. D. Eaves (Emeritus), Ph.D. Texas; H. Frandsen, Ph.D. Illinois; J. A. George (Distinguished Scientist), Ph.D. Stanford; T. G. Hallam, Ph.D Missouri; D. B. Hinton, Ph.D. Tennessee; A. S. Householder (Emeritus), Ph.D. Chicago; L. S. Husch, Ph.D. Florida State; G. S. Jordan, Ph.D. Wisconsin; R. M. McConnel, Ph.D. Duke; H. T. Mathews, Ph.D. Tulane; D. D. Miller (Emeritus), Ph.D. Michigan; B. S. Rauput, Ph.D. Illinois; K. C. Reddy (UTSI), Ph.D. Indian Institute of Technology, Delhi; W. S. Schaefer, Ph.D. Maryland; S. Serbin, Ph.D. Cornell; K. Soni, Ph.D. Oregon State; F. W. Stahmann (Emeritus), Ph.D. Giessen (Germany); E. Wachspress, Ph.D. Rensseleer Polytechnic Institute; W. R. Wade, Ph.D. California (Riverside); C. G. Wagner, Ph.D. Duke; J. J. Walsh, Ph.D. SUNY (Binghamton).

Associate Professors:
A. Alexiades, Ph.D. Delaware; N. Alilkakos, Ph.D. Brown; D. F. Anderson, Ph.D. Chicago; J. Dyadak, Ph.D. Warsaw; L. J. Gross, Ph.D. Cornell; O. Karakashian, Ph.D. Harvard; K. R. Kimble (UTSI), Ph.D. Ohio State; Y. Kuo, Ph.D. Cincinnati; B. A. Kuperschmidt (UTSI), Ph.D. Massachusetts Institute of Technology; S. Lenhart, Ph.D. Kentucky; J. Rosinski, Ph.D. Wroclan (Poland); W. H. Row, Jr., Ph.D. Wisconsin; R. Rowlett, Ph.D. Virginia; H. Simpson, Ph.D. California Institute of Technology; J. Smith, Ph.D. California (Berkeley); R. P. Soni, Ph.D. Oregon State; K. R. Stephenson, Ph.D. Wisconsin; C. Sundberg, Ph.D. Wisconsin.

Assistant Professors:
L. Bales, Ph.D. Cornell; J. Haefner, Ph.D. Wisconsin; S. Harirhan (UTSI), Ph.D. Carnegie Mellon; S. Mulay, Ph.D. Purdue; R. Sivry, Ph.D. Johns Hopkins.

The Mathematics Department has three graduate degrees: (1) the Master of Mathematics degree, intended primarily for teachers of high school mathematics, (2) the Master of science degree, designed to prepare students for industrial employment and for teaching at the high school and junior college level, and (3) the Doctor of Philosophy degree, designed to prepare students for industrial employment and for college and university teaching and research. Contact the department office for additional information.

THE MASTER'S PROGRAM
The Master of Mathematics is intended primarily for teachers of high school mathematics.

Before admission to this program, the applicant must have either (a) certification for teaching secondary mathematics in at least one state or, (b) three years of elementary or secondary school teaching experience. 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 course work of which 21 must be at the 500 level. The course work must include 504, 505, 506, 507, and 6 hours in 508. 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 course work.

In exceptional circumstances, part of admission requirement (b) might be satisfied concurrently with course work. Normally Master of Mathematics degree students will start the program by taking 504 during the summer.

The Master of Science program is designed to prepare students for industrial employment and for teaching at the high school and junior college level.

The department offers two options for this degree. The first option requires a thesis for which 6 hours must be earned along with 24 additional hours of work in acceptable courses numbered above 400. Of the additional hours, 6 may be in an area outside the department and 15 must be in courses in mathematics numbered above 500.

After one semester of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 30 hours in courses numbered above 400 are required. Of these, 21 hours (at least 15 of which must be in mathematics) must be in courses numbered above 500. Of the 30 hours, 9 in courses approved by the supervisory committee may be taken in fields other than mathematics. For this option it is also required that a written final examination be taken and that credit be received for a reading course (598) in which a term paper or project is required. A student offering mathematics as a minor for the Master's degree is required to obtain at least 6 hours of residence graduate credit in courses numbered above 400 and approved by both the major department and the Department of Mathematics.

THE DOCTORAL PROGRAM
For the Ph.D. in Mathematics, the student must meet the following four requirements:

1. Satisfy either of the following: A, the standard program or B, 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 also be permitted to complete only one of the other provided that 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 interdisciplinary mathematical ecology concentration.

A. Standard program: Pass written exam-
students who choose four from this list must choose two from 1.

1. Modern Algebra 551-52
2. Complex Analysis 543-44
3. Topology 561-62
4. Real Analysis 541-42
5. Applied Linear Analysis 547-48
7. Ordinary Differential Equations 531-32
8. Numerical Mathematics 571-72
9. Statistics 525-26
10. Probability 523-24

Students may not count passes of examinations in both 4. and 5. in both 6. and 7., nor in both 9. and 10. toward the required four passes. Those students who choose four from this list must choose two from 1. through 5.

A student 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. For a given student and a given area, the Graduate Committee will appoint a section of the student's supervisory committee. For that student by the Graduate Committee and the Applied Mathematics Committee. For a given student and a given area, the Graduate Committee will appoint a section of the student's supervisory committee.

A given student and a given area, the Graduate Committee will appoint a section of the student's supervisory committee. The student's doctoral committee may require that the student pass a second language exam.

A student may take the written exam in the field of specialization. This examination will be given by a committee appointed by the department head at some time after the requirements of I. have been met. A student may take this specialty examination only twice.

Take a one-year, 600-level sequence in mathematics and two from the list under the standard program.

Students may not count passes on 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 supervisory committee.
2. At most, 4-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
3. A student may take a collection of written examinations a maximum of four times, but no one failing four exams, counting possible repetitions, will be permitted to take another round of exams.
4. Pass a written examination in ecology, covering material selected from nine hours of course work outside of mathematics at the 500 level or above.
5. The course submitted for examination must be approved by the student's supervisory committee and the departmental Graduate Committee. The exam is to be prepared, administered, and graded by instructors of the course involved, along with at least one member of the mathematical ecology section. The student must obtain written agreement to participate in the examination from instructors of these courses and from at least one member of the mathematical ecology section, before submitting materials to the committees for approval.
6. A student may take the written examination at most twice.

II. Demonstrate proficiency in one foreign language, normally from among 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.

III. 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 of I. have been met. A student may take this specialty examination only twice.

IV. Take a one-year, 600-level sequence in mathematics and two from the list under the standard program.

The student must obtain written agreement from instructors of the course involved, along with at least one member of the supervisory committee. These courses and from 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. Mathematical ecology concentration

1. Pass written examinations covering three subjects in mathematics; one mathematics course in mathematical ecology and two from the list under the standard program.

Students may not count passes on examinations in both 4. and 5., in both 6. and 7., nor in both 9. and 10. toward the required three passes. At least one exam must be chosen from 1. through 5.

A student 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 supervisory committee.
(b) At most 3-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.
(c) A student may take a collection of written examinations a maximum of three times, but no one failing
for the student not otherwise registered during any semester, the student uses University facilities only or faculty time before degree is completed. May not be used toward degree requirements. Prereq: 5/NC only, E

503 MBA Calculus (3) Review of derivatives and antiderivatives and their applications to functions of two variables, introductory matrix algebra. Credit available only to satisfy MBA core requirements. Prereq: 121.

504 Discrete Mathematics for Teachers (3) Mathematical logic and proof techniques; sets, functions and relations, combinatorics. Normally first graduate course for students seeking M.S. degree. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus, 141-42, or equivalent.

505 Analysis for Teachers (3) Development of differential and integral calculus, proofs of basic theorems. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus, 141-42, or equivalent, and 504.

506 Algebra for Teachers (3) Algebraic structures: integers, rational numbers, and their applications to algebra of integers and polynomials. For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: 1 yr calculus, 141-42, or equivalent, and 504.

509 Seminar for Teachers (3) For students in Master of Mathematics program and for students in graduate programs in College of Education. May not apply toward M.S. degree in mathematics. Prereq: Consent of instructor or 453 and program requirements. Maximum 12 hrs.


517-18 Mathematical Methods in Physics (3,3) (Same as Physics 571-72.)

519 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.

521-22 Applied Combinatorics (3,3) Application of finite differences, generating functions, and permutation groups to enumeration problems. Coding theory, experimental design, graph theory, or decision theory. Prereq: Consent of instructor.

523-24 Probability (3,3) Pertinent facts from probability theory, definition of abstract probability spaces; Kolmogorov's existence theorem; series of independent random variables and laws of large numbers; general theory of distributions of random vectors and their characteristic functions; weak convergence concept, weak compactness and Levy's continuity theorem in Euclidean spaces; infinitely divisible distributions and central limit problem; general concept and properties of martingales, Doob's martingale and optional sampling theorems. Prereq: 445-46. Recommended prereq: 423.

525-26 Statistics (3,3) Pertinent facts from probability theory; formulation of statistical models; sufficiency, Fisher's Factorization theorem, exponential families, Bayesian models; methods of estimation and optimality, maximum likelihood, least squares, and biased estimates, asymptotic efficiency and optimality; the confidence procedures and hypothesis testing; option on analysis of variance and Neyman-Pearson lemma, uniformly most powerful tests; general linear models, estimation and tests in linear models; non-parametric models. Rank methods for data analysis, linear regression and independence, robust tests; topics from decision theory. Prereq: 445-46. Recommended prereq: 425.

527 Stochastic Modeling (3) Models in probability applied to situations: queuing theory branching processes; Monte Carlo simulation. Prereq: 445-46 or consent of instructor.


535-36 Partial Differential Equations (3,3) First order equations, classification of equatixns and properties of elliptic, hyperbolic, and parabolic equations in several variables. Prereq: 445-46 and 231 or consent of instructor.

539 Seminar in Differential Equations (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


549 Seminar in Analysis (1-3) May be repeated. Maximum 12 hrs.

550 Matrix Algebra (3) Advanced topics in matrix theory; decomposition theorems and applications to matrices with special structure. Prereq: 453 or consent of instructor.

551-52 Modern Algebra (3,3) Groups, rings, modules and linear algebra, fields and Galois theory. Must be taken in sequence. Prereq: 455-56 or consent of instructor.

553 Linear Programming (3) Theory and applications. Prereq: Consent of instructor or 453 and programming ability.


555-56 Number Theory (3,3) Introduction to algebraic number theory. Prereq: 445-56 or consent of instructor.

559 Seminar in Algebra (1-3) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

561-62 Topology (3,3) Topological spaces; metrizable and paracompact spaces; normality of products; Tychonoff compactification. Prereq: 453 or consent of instructor.

563-64 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. (See 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: 451, 453 or consent of instructor.

584 Mathematical Systems Theory (3) Analytic approach to discrete and continuous dynamical systems; optimal control. Applications to ecology. Prereq: 431, 451, 453-46 or consent of instructor.

585 Optimal Control Theory (3) Deterministic optimal control. Examples involving calculus of variations, optimal trajectories, and engineering control problems. Introduction to stochastic control. Prereq: 431, 445-46 or consent of instructor.

587 Seminar in Mathematical Ecology (1-3) May be repeated. Maximum 12 hrs.

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

588 Graduate Reading in Mathematics (1-3) Independent study with faculty guidance. Prereq: Graduate standing and consent of instructor. May be repeated. Maximum 6 hrs.

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

617-18 Lie Algebras in Mathematics and Physics (3,3) Analysis, representation theory and computation of Lie algebras. Classification of irreducible representations, relationship to modern commutative and Morita theory.

618 Lie Algebras in Mathematics and Physics (3,3) Structure of Lie algebras and the theory of representations. Lie algebras, Lie groups, and their applications to Hamiltonian mechanics, bifurcation theory, fluids and plasmas, modern foundations in continuum mechanics. Prereq: 431, 435, 547, 571-72. (Same as Physics 617-18.)

619 Seminar in Applied Mathematics (1-3) May be repeated. Maximum 12 hrs.


631-32 Advanced Ordinary Differential Equations (3,3) Theory of ordinary differential equations from advanced perspective. Topics from current literature. Subject matter varies according to interests and preparations of students. Prereq: 521-32 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

635-36 Advanced Partial Differential Equations (3,3) Selected topics in classical and modern theoretical partial differential equations. Prereq: 541-42 or 547-48 or consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

643-44 Harmonic Analysis (3) Fourier series and Fourier transforms on Euclidean spaces or topological groups: convergence, summability, uniqueness, inversion, duality, Plancherel transform, Hardy transform, Hardy-Littlewood maximal function, interpolation of normed operators, or Fassert-Sin-duality. Prereq: 541-42 and 543. May be repeated with consent of department. Maximum 12 hrs.

649 Seminar in Analysis (1-3) May be repeated with consent of department. Maximum 12 hrs.

551-52 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.

569 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 Hurwitz isomorphism theorem. Prereq: 561-62 and 1 yr of abstract algebra, 455-56 or 651-52. May be repeated with consent of department. Maximum 12 hrs.

665-66 Topological Algebra (3,3) Topological semigroups, topological groups, Lie groups, transformation groups, topological lattices, relations in topological spaces; topological rings, fields, algebras. Prereq or coreq: 561-62. 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.

Mechanical and Aerospace Engineering
(College of Engineering)

MAJORS DEGREES
Aerospace Engineering M.S., Ph.D.
Mechanical Engineering M.S., Ph.D.

Don R. Pitts, Head
A. J. Fournier, Associate Head


Assistant Professors: M. Keyhani, Ph.D. Ohio State; K. Nguyen, Ph.D. Colorado (Boulder).

Space Institute, Tullahoma.

Graduate programs in Mechanical Engineering or Aerospace Engineering are available that lead to the Master of Science and Doctor of Philosophy with concentrations in energy conversion and utilization, propulsion, heat transfer and fluid mechanics, and thermodynamics. In addition, Mechanical Engineering offers concentrations in gasdynamics, machine design and dynamics, power generation, and stress analysis; Aerospace Engineering offers structures and stress analysis, aerodynamics and gasdynamics, flight mechanics, and aeroacoustics. Each student must satisfactorily complete a program of study that has been approved by the student's committee. Specific program requirements are given below.

THE MASTER'S PROGRAM
Entrance into the Master of Science program is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options are available.

Thesis Option
The requirements of this option are that the student must satisfactorily complete a program of study that includes:
1. A minimum of 24 semester hours of course work that includes at least 12 semester hours of graduate (500-level or above) courses in mechanical and/or aerospace engineering and normally 6 semester hours of course work (400-level or above) in mathematics. No more than 3 semester hours of engineering course work may be below the 500 level.
2. Participation in the departmental seminar program.
3. Passing a comprehensive written and oral final examination on all course work 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 course work that includes at least 12 semester hours of graduate (500-level or above) courses in mechanical and/or aerospace engineering and normally 6 semester hours of course work (400-level or above) in mathematics. No more than 3 semester hours of engineering course work 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 course work submitted for the degree and an oral examination on all work (including problems).

THE DOCTORAL PROGRAM
Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds. The student must satisfactorily complete an approved program of study that includes a minimum of 72 semester hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems, including:
1. A minimum of 24 semester hours in doctoral dissertation.
2. A minimum of 12 semester hours in
mathematics in courses numbered 400 or above. 3. A minimum of 24 semester hours in mechanical and/or aerospace engineering courses numbered 500 and above, with at least 9 semester hours of 600-level courses. These are exclusive of thesis, problems, or dissertation credit.
4. Participation in the departmental seminar program.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES Selected (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.


416 Turbo-Machinery (3) Basic principles of turbo-machinery; systematic methods of analysis, design, performance evaluation. Prereq: Aerospace Engineering 351.

422 Environmental Noise (3) Basic principles of acoustics: measurements and control of noise in industrial and community environments. Prereq: Senior standing in engineering or consent of instructor.

445 Lubrication (3) Hydrodynamic theory of lubrication of sliding bearings; application of Navier-Stokes equations to infinite and finite bearings; analytical and numerical solutions; applications to design. Prereq: 344, Aerospace Engineering 391.


455 Introduction to Design (3) Engineering economy, optimization, design for automation, reliability, product liability; design of mechanical engineering solid mechanics system. Participation in team design effort; design report. Prereq: 363 and 465. F.

456 Introduction to Thermal Design (2) Engineering economy, optimization, design for automation, reliable, economic and aesthetic design of mechanical engineering thermal-fluid system. Participation in team design effort; design report. Prereq: 332, 344. F.


462 Tool Design (3) Principles underlying tool and die design; design for high volume production; work holding fixtures; comparison of material removal methods; selection of tool material; plastics production. Prereq: 366 or Industrial Engineering 404, Engineering Science and Mechanics 321.


471 Refrigeration and Air Conditioning (3) Vapor compression and absorption cycles; heat pump systems; psychrometric processes; air washers; cooling towers; solar radiation; building heat transmission. Prereq: 332, 344.

484 Solar Energy Utilization (3) Nature and availability of solar resources; solar heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and method of storage; solar 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 (3) Design of complete thermal/fluid system; economic; technical and optimization aspects. Participation in team design effort, formal presentations and design report. Prereq: 456, 475, F.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 before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E.

511 Conduction Heat Transfer (3) Analysis of steady-state and time dependent heat conduction by analytical and numerical methods. Modeling of thermal systems. Prereq: 344.

512 Convection Heat Transfer (3) Analysis of laminar and turbulent heat transfer in internal and external flows, effects of variable surface temperature or heat flux and variable fluid properties. Prereq: 345.


521-22 Thermodynamics I and II (3,3) Macroscopic thermodynamics, including First and Second Law analyses, availability, phase and chemical equilibrium criteria, combustion, gas mixtures, and property relations, determination of thermodynamic properties from molecular structure, spectrophotometric data, kinetic theory, statistical mechanics, quantum physics, Schroedinger equation. Prereq: 332.

523 Special Topics in Thermodynamics (3) Application of thermodynamics to topics of current interest in mechanical engineering. Prereq: Consent of instructor.


541-42 Research in Mechanical Engineering I and II (3,3) Design of experiments; data analysis; experimental investigation. Prereq: Consent of instructor.

551-52 Mechanical Engineering Design (3,3) Design of mechanical, thermal, fluid, and/or electrical devices and systems. Prereq: 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 structures. Prereq: 569 and 464 or consent of instructor.

561 Experimental Stress Analysis (3) Experimental stress analysis, photoelasticity, strain gauges. Prereq: Consent of instructor.

567-68 Dynamics of Machinery (3,3) Kinematics and kinetostatics; fixed, moving and rotating coordinate systems; linear and angular momentum; energy methods; computational techniques derived from Lagrangian 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.


581 Rocket Propulsion I (3) Rocket propulsion fundamentals; thermodynamics of nonreacting and chemically reacting gas; rocket nozzle design; ideal rocket performance parameters; rocket heat transfer; chemistry of propellants; rocket engine systems; ground testing; introduction to solid propellant rockets. Prereq: Consent of instructor.

582 Rocket Propulsion II (3) Solid propellant rocket performance, homogeneous and heterogeneous propellant chemistry and combustion system performance, thermal decomposition and gas phase reaction models; effect of chamber pressure and additives on solid propellant high temperature behavior; analysis of two-phase solid rocket exhaust flow. Introduction to nuclear and electric propulsion; electrical resistance and magnetic field (cogeneration performance, magnetohydrodynamic thrusters, traveling wave thrusters; exotic propulsion systems. Prereq: Consent of instructor.
Aerospace Engineering

422 Aerodynamics (3) Theory and design of aerodynamic bodies for given characteristics. Potential flow theory. Inviscid, inviscid, and similar flow effects. Subsonic, transonic, and supersonic airfoils. Prereq: 421. Sp

423 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods. Prereq: 351, Mechanical Engineering 391. Sp

424 Astrodynamics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems. Prereq: 362, Mechanical Engineering 332. Sp

425 Propulsion (3) Principles of propulsion devices; turbojet, ramjet and rocket engines. Prereq: 351. F

426 Introduction to Aerospace Design (3) Design process, synthesis, safety, reliability, products, product liability, economic analysis, optimization, design standards, design studies. Individual design reports. Prereq: 351, 370, 393. Coreq: Mechanical Engineering 344. F

429 Aerospace Systems 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

444 Aerospace Engineering Laboratory (3) Experimental techniques with laboratory exercises. Prereq: Consent of instructor. Prereq: Mechanical Engineering 344. 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.

511 Inviscid Flow (3) Kinematics and dynamics of inviscid fluids; potential flow about body, conformal mapping. Prereq: 422 or Mechanical Engineering 531. Mathematics 425 or equivalent.

512 Viscous Flow (3) Equations of viscous fluid flow; laminar and turbulent flow; transition; separation; boundary layer theories; exact and approximate solutions. Prereq: Mechanical Engineering 531 or equivalent.

513 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments. Prereq: Longitudinal and variety of fluid mechanics, thermodynamics, and turbulence measurements, flow visualization, wind tunnel tests, water table experiments, supersonic flow experiments and boundary layer measurements. Coreq: Mechanical Engineering 531.

515-16 Air Vehicle Aerodynamics and Performance (3) Application of aerodynamics principles to air vehicles to provide estimates of performance, safety, and control characteristics for subsonic to hypersonic speeds. Relations among thrust, drag, lift and attitude, propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 422; 515 for 516.

521-22 Aerodynamics of Compressible Fluids (3,3) One-dimensional and external flow, waves; small perturbation theory; slender body theory; similarity rules; method of characteristics. Prereq: 422 for 521; 522 for 522.

525 Hypersonic Flow (3) slender body flow; similarity; Navierton theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 515.

527-28 Aerospace Ground Test Facilities (3-4) Atmospheric and space environmental tests. Prereq: 422. Mechanics 351 or equivalent.

531 Magneto-hydrodynamics (3) Electromagnetic field theory; chemical kinetics; thermodynamic and thermophysical properties of gas plasmas; governing equations and applications. Prereq: 422 and Mathematics 471.

532 Introduction to Turbulence (3) Macroscopic effects, analogs, statistical treatment, correlation functions, energy spectra, diffusion; application of turbulent jets and pipe flow. Prereq: 511-12.

534 Atmospheric Entry (3) Reentry trajectories; lift and drag during reentry; vehicle motion and stability during reentry; aerodynamic heating and heat protection systems. Prereq: 522. Recommended prereq: 512.


554-SS Aerospace Vehicle Stability and Control (3,3) Static and dynamic longitudinal directional and lateral stability and control. Control modes. Motion with free and fixed flight control surfaces. Automatic control systems. Prereq: 423, 551.

555 Vertical or Short Take Off and Landing Aircraft (SS,SS) Stance, stability, control of rotary wing, tilt wing, vectored lift and jet vertical rister aircraft. Vertical and transition flight modes. High lift airfoils. Automatic controls. Simulation facilities and flight testing. Prereq: 555.


561 Fundamentals of Aeronautics (3) Generation, propagation and absorption of sound in static and moving media. Prereq: Consent of instructor.

562 Measurement Science I (3) (Same as Nuclear Engineering 589, Chemical Engineering 589, Civil Engineering 589, Electrical and Computer Engineering 589, Engineering Science and Mechanics 589, and Mechanical Engineering 589.)

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

570 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor. May be repeated. S/NC only.

590 Selected Engineering Problems (2-6) Enrollment limited to students in problems program. Prereq: Consent of advisor. May be repeated. S/NC only.

595 Seminar (1-3) All phases of aerospace engineering, reports on current research at UTK. May be repeated. S/NC only.

599 Special Topics in Aerospace Engineering (1-3) May be repeated. Maximum 9 hrs. Prereq: Consent of advisor. May be repeated. S/NC only.
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.

500 Thesis (1-15) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only. E
508 Graduate Research Participation (3) Advanced research techniques while conducting individual bio-medical research project. Open to all graduate students. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. S/N/C 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.
522 Special Topics in Cancer (1-3) Prereq: 521 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp.
531 Principles of Hematology (3) Pathophysiology of blood and blood forming systems. Lectures, class discussions and demonstrations. Prereq: Upper division histology and/or cell biology. Zoology 410 and 420.
532 Special Topics in Hematology (1-3) Prereq: 531 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp.
542 Special Topics in Metabolic Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: 541 and consent of instructor. May be repeated. Maximum 9 hrs. F,Sp.
545 Clinical Genetics (3) Human genetic disorders: new developments in cytogenetics, molecular genetics, clinical diagnoses and prevention. Prereq: Biology and genetics background or consent of instructor.
600 Doctoral Research and Dissertation (3-15) P/NP only. E
653 Special Topics in Pathology (1-3) Pathologic anatomy, biochemical pathology, and related areas. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. F,Sp.
THE MASTER'S PROGRAM

The program leading to the M.S. is designed to provide the student with broad basic knowledge 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 develop the student's ability to pursue independent and original research in microbiology and allied fields, to teach both oral and written communication of the results of research to the scientific community, and to train effective teachers. Students may enter the program after receiving either a Bachelor's or Master's degree. Students who enter with a Bachelor's degree usually receive the Ph.D. after four or five years; those with the Master's degree usually take three or four years to complete the degree.

Departmental requirements are: (1) a 3.0 GPA in all courses taken for graduate credit after 12 hours of credit have been earned in courses graded on the A-F scale; (2) a 3.0 GPA in courses taken in the department; (3) satisfactory performance in at least one semester as a teaching assistant; (4) one semester of physical chemistry; (5) one course in statistics; (6) courses in at least five of the sub-disciplines listed in the Master's program; (7) satisfactory performance in a comprehensive examination that must be passed before admission to candidacy; and (8) the presentation of a written research proposal and its oral defense.

593 Independent Study (1-15) See page 31.
594 Selected Topics in Microbiological Research (2-4) Literature surveys and discussions of selected topics. Prereq: Graduate standing. May be repeated. Maximum 8 hrs. S/NC only.
595 General Seminar (1) Lectures and seminars by invited speakers, faculty, and graduate students. May be repeated. Maximum 18 hrs. S/NC only. E
596 Laboratory Rotation (1) Familiarization with research areas in department through series of rotations in laboratories of individual faculty members. May be repeated. Maximum 3 hrs. S/NC only.
600 Doctoral Research and Dissertation (3-15) P/NC only.
601 Journal Club in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E
602 Journal Club in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E
603 Journal Club in Immunology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E
604 Journal Club in Virology (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E
605 Journal Club in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. Maximum 18 hrs. S/NC only. E
606 Current Topics in Biological Membrane Research (1) (Same as Biochemistry 606.)
610 Advanced Topics in Microbial Physiology (3) Prereq: 510 or consent of instructor. May be repeated. Maximum 12 hrs.
620 Advanced Topics in Microbial Pathogenesis (3) Prereq: 520, 530 or consent of instructor. May be repeated. Maximum 12 hrs.
630 Advanced Topics in Immunology (3) Prereq: 530 or consent of instructor. May be repeated. Maximum 12 hrs.
640 Advanced Topics in Virology (3) Prereq: 440, 540, or consent of instructor. Maximum 12 hrs.
650 Advanced Topics in Microbial and Molecular Genetics (3) Prereq: 550 or consent of instructor. May be repeated. Maximum 12 hrs.
670 Advanced Topics in Environmental Microbiology (3) Prereq: 570 or consent of instructor. May be repeated. Maximum 12 hrs.

Microbiology - Veterinary Medicine

See Veterinary Medicine for program description.

PROFESSIONAL COURSES

811-12 Microbiology UJ (5,4) Pathogenesis of bacterial, fungal and viral diseases. Study relating microbial structure, metabolism and genetics to patterns of disease and mode of action of antimicrobials, antigens and antibodies. Immunobiology, study of mechanisms of immune reaction, diagnosis 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.
Music
(College of Liberal Arts)

MAJOR DEGREES
Music.......................................................... M.M., M.A.

John J. Meacham, Head

Professors:
G. C. Bitzas, M.M. Converse; J. P. Brock, M.M. Alabama; J. Coker, M.A. Sam Houston; F. M. Combs, M.A. Missouri; G. F. DeVine (Emeritus) Diploma, Schurz (Chicago); W. Dorn, M.A. Columbia; H. W. Fred, Ph.D. North Carolina; C. R. Huber, Ph.D. North Carolina; J. J. Meacham, M.M. Northwestern; D. M. Pederson, Ph.D. Iowa.

Associate Professors:

Assistant Professors:
W. Hawthorne, Ph.D. Cincinnati; D.M.A. Yale; D. Ogden, M.M. Texas; E. Schroeder, Ph.D. Stanford; G. M. Speri, M.M. Indiana.

The Department of Music offers the Master of Music with concentrations in accompanying, choral conducting, composition, instrumental conducting, performance (organ, piano, strings, voice, wind, and percussion), voice pedagogy, and literature, sacred music, string pedagogy, and theory, and the Master of Arts in Music with concentrations in musicology and theory.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by UTK, appropriate to the applicant's prospective area of concentration on the Master's level.

Applicants who plan to pursue the concentration in performance 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. 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 and music history/literature. These examinations are given by the Department of Music at the beginning of each semester. All concentrations require a written and oral final examination.

THE MASTER OF MUSIC PROGRAM
A minimum of 30-33 semester hours of course work is required for the Master of Music. These hours are specifically distributed according to the area of concentration. All concentrations require course work in music history/literature and music theory and allow for elective courses. Specific curricula are available from the Department of Music.

The graduate recital is given in lieu of thesis by Master of Music degree students with concentrations in performance, pedagogy, and accompanying. A performance project is given in lieu of thesis by students with concentrations in choral conducting, instrumental conducting, and sacred music. A thesis is required of students in composition and theory.

THE MASTER OF ARTS PROGRAM
A minimum of 33 semester hours, including 18 hours of course work above the 500 level and 6 hours of thesis, is required for the Master of Arts. Specific curricula are available from the Department of Music. A reading knowledge of French or German must be demonstrated by applicants before being admitted to candidacy.

Music General
500 Thesis (1-15) P/NP only. E
501 Graduate Recital (2)
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
511 Lecture Recital (2)
512 Special Topics in Performance (1-3) Prereq: Consent of department head.
513 Church Music Performance Project (1-2) May be repeated. Maximum 3 hrs.

Music History
410 Music History Genre (3) Topics vary. May be repeated. Maximum 6 hrs.
420 History of Opera (3) Dramatic, vocal, and orchestral elements in opera of Italian, French, and German schools, 1600-present.
430 Symphonic Literature (3) Literature for orchestra from Baroque to present, evolution of symphony.
440 Music of North America (3) Folk and art music of U.S. and Canada from colonial times to present.
450 Composer Seminar (3) Life and works of single composer. Subjects vary.
460 Music Aesthetics (3) Nature of music and musical experience, sense perception and emotions, music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.
490 Church Music Methods and Administration (3)
510 Music Bibliography (2) Bibliographic methodology in music.
520 Music Research (1) Principles of research methodology applied to writing of research proposal and project.

530 Music in the Middle Ages (3) Gregorian and medieval chant, secular monophony, and rise of polyphony.
540 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chanson, madrigal, and other vocal and instrumental forms and genres.
550 Music in the Baroque Period (3) From c.1600 to 1750: rise of opera and oratorio, sacred and secular cantatas, instrumental forms, performance practice.
560 Music in the Classic Period (3) Evolution of classical style from pre-classic music to music of Haydn, Mozart, and early Beethoven.
570 Music in the Romantic Period (3) Nineteenth-century musical styles from Beethoven to post-romanticists.
580 Music in the Twentieth Century (3) From 1880, Debussy, to present, Stockhausen and others.
590 World Music (3) Attitudes and techniques of ethnomusicology. Survey of world music cultures. Interview and transcription projects.
593 Independent Study (1-15) See page 31. Prereq: Consent of department head.

Music Instrumental
410 Band Arranging (3) Study and application of techniques employed in arranging for marching and concert bands. Prereq: Music Theory 320.
490 Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to aductor's art; musical analysis, and practice in conducting. Prereq: Music Education 320 or equivalent.
570 Advanced Suzuki Pedagogy (2) Study of psychology, procedures and literature utilized by Shinichi Suzuki in Japan. Prereq: 495 or consent of instructor. May be repeated. Maximum 4 hrs.
580 Band Literature (3) Band literature and origins of band, its important expanded cultivation during past century in United States and Europe.
582 Instrumental Conducting Performance (1) Jury performance; conducting bands or orchestra in public.
583 Practicum for Instrumental Conductors (1) Intern experience in coordination, 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
410 Advanced Improvisation (3) Further development of individual skills and solving individual problems in jazz improvisation. Prereq: 210 and 220.
420 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz, designing and administering jazz programs, and rehearsal techniques for jazz ensembles. Prereq: Studio music and jazz major or consent of instructor.

Music Keyboard
410 Early Keyboard Literature (2) Keyboard music through baroque period with music for harpsichord. Prereq: Music History 210-20.
420-30 Piano Literature I, II (2, 2) From 1750 to middle 19th century; 430—Middle 19th century to present.

460-70 The Organ and Its Literature I, II (3, 3) Development of organ and organ literature from Middle Ages to present; problems of style and interpretation,
pedagogical literature and methods; organ design. Prereq. or coreq: Music History 220 and consent of instructor.

520 Piano Literature Seminar (2) Topics vary. May be repeated. Maximum 6 hrs.

531-41 Recital Project (2,2) Preparation and accompaniment of full recital for accompanying concentrations only. 531—Vocal recital, 541—Instrumental recital. Prereq: Consent of instructor.

540-50 Advanced Piano Pedagogy LII (2,2) 540—Evaluation and study of methods and materials for teaching piano at all levels. Supervised laboratory teaching. Prereq: 440, 450, or consent of instructor. 550—Introduction and principles of Kodaly, Orff, Suzuki, Dalcroze Eurhythmics, and class piano teaching. Prereq: 440, 450 or consent of instructor.

560 Organ Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

Music Theory

430-40 Counterpoint LII (3,3) 430—Study of species counterpoint in modal and tonal styles, works of Palestrina and J. S. Bach. Prereq: 220. 440—Writing of contrapuntal forms of 18th century and fugue; analysis of works from 18th through 20th centuries. Prereq: 430.

510 Musical Styles (3) Elements of design and their role in definition of musical styles. Prereq: Consent of instructor.

520 Analytical Techniques (3) Analytical techniques, contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.

530 Music Theory Pedagogy (3) Techniques, methods, and materials involved in college-level theory programs. Prereq: Consent of instructor.

540 Computer Projects (1-3) Programming languages, design and implementation of projects in computer-managed instruction. Prereq: Consent of instructor.

550 Music Theory Seminar (1-3) Topics vary.

593 Independent Study (1-15) See page 31. Prereq: Consent of department head.

Music Voice

430 Styles in Opera Acting (2) Study and practice of styles in opera acting based on historical and national characteristics. Prereq: 230.

440 Projects in Opera Theatre (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

510 Vocal Literature Seminar (3) Topics vary. May be repeated. Maximum 6 hrs.

530 Opera Performance (2) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

540 Opera Production (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

550-60 Advanced Vocal Pedagogy LII (2,2) 550—Study of vocal production, examination of different methods. 560—Study of teaching materials, observation of studio teaching, analysis of vocal problems in selected students, and supervised teaching.

570 Vocal Chamber Music Performance (2) Prereq: Consent of instructor.

580-85 Choral Literature LII (2,2) Choral music from middle ages to present with consideration of historical development of major choral genres.

590 Advanced Choral Conducting (3) Expansions and continued refinement of conducting technique; development of choral rehearsal skills. Prereq: Consent of instructor.

594 Project in Choral Conducting Performance (1-3) Public performance, critical document, recording project. Prereq: Consent of instructor. May be repeated.

595 Choral Conducting Seminar (3) Score reading and preparation; problems of interpretation, performance practices, and conducting techniques. Prereq: 590 or consent of instructor. May be repeated.

Music Performance

All performance courses require an audition and consent of instructor. May be repeated. Maximum 8 hrs toward M.M. degree.

403 Flute (1-4)
405 Oboe (1-4)
410 Bassoon (1-4)
415 Clarinet (1-4)
420 Saxophone (1-4)
425 Horn (1-4)
430 Trumpet (1-4)
435 Trombone (1-4)
440 Baritone (1-4)
445 Tuba (1-4)
450 Percussion (1-4)
455 Voice (1-4)
460 Violin (1-4)
465 Viola (1-4)
470 Cello (1-4)
475 String Bass (1-4)
476 Electric Bass (1-4)
479 Guitar (1-4)
480 Piano (1-4)
483 Men's Chorale (1) May be repeated.
485 Harpsichord (1-4)
490 Orchestra (1-4)
494 Composition (1-3)
495 Composition with Electronic Media (1-3)
496 Composition for Media (2)
499 Improvisation (1-2) May not be used toward applied music requirement.
503 Flute (1-4)
505 Oboe (1-4)
510 Bassoon (1-4)
515 Clarinet (1-4)
520 Saxophone (1-4)
525 Horn (1-4)
530 Trumpet (1-4)
535 Trombone (1-4)
540 Baritone (1-4)
545 Tuba (1-4)
550 Percussion (1-4)
555 Accompanying and Coaching (1-4)
555 Voice (1-4)
560 Violin (1-4)
565 Viola (1-4)
570 Cello (1-4)
575 String Bass (1-4)

575 Electric Bass (1-4)
579 Guitar (1-4)
580 Piano (1-4)
585 Harpsichord (1-4)
590 Organ (1-4)
594 Composition (1-3)
595 Composition with Electronic Media (1-3)

Music Ensemble

501 Woodwind Choir (1) May be repeated.
503 Small Jazz Ensemble (1) May be repeated. Maximum 12 hrs.
504 Jazz Ensemble (1) May be repeated.
505 Studio Orchestra (1) May be repeated. Maximum 12 hrs.
506 Trombone Choir (1) May be repeated.
509 Tubas Ensemble (1) May be repeated.
510 Percussion Ensemble (1) May be repeated.
511 Mariachi Choir (1) May be repeated.
512 Baroque Ensemble (1) May be repeated.
513 Synthesizer Ensemble (1) May be repeated.
514 Brass Choir (1) May be repeated.
515 Chamber Music Ensemble (1) May be repeated. Maximum 12 hrs.
520 UT Singers (1) May be repeated.
530 Chamber Singers (1) May be repeated.
532 Collegium (1) May be repeated.
534 Saxophone Choir (1) May be repeated.
540 Opera Theatre (1) May be repeated.
542 Opera Workshop (1) May be repeated.
550 Concert Band (1) May be repeated.
552 Campus Band (1) May be repeated.
554 Varsity Band (1) May be repeated.
556 Laboratory Band (1) May be repeated.
559 Marching Band (1) May be repeated.
570 Symphony Orchestra (1) May be repeated.
580 Concert Choir (1) May be repeated.
582 University Chorus (1) May be repeated.
583 Men's Chorale (1) May be repeated.
589 Women's Chorale (1) May be repeated.
599 Accompanying (1) May be repeated.

Nuclear Engineering

(College of Engineering)

MAJOR DEGREES

Nuclear Engineering .......................M.S., Ph.D.
Pietro F. Pasqua, Head

Professors:
H. L. Dodds, Ph.D. Tennessee, P.E.;
An alternate program is available that involves satisfying the research component through engineering practice problems rather than a thesis. The engineering practice option provides the student with the opportunity to perform research in two, three, or four different areas as opposed to the traditional thesis, which involves in-depth research in one area. Engineering practice problems are usually smaller in scope than a thesis and must have prior approval of a member of the faculty. The student must complete a program of study that includes the following:

1. Twenty-four semester hours of course work similar to the requirements for the usual Master of Science program (see above).
2. Sixteen hours of NE 598 Nuclear Engineering Practice. Students register for NE 598 each semester. At the end of each semester, the student makes an oral presentation of the work. Upon completion of each credit, the student submits a formal written report of the work.
3. Final oral examination covering graduate course work and practice school problems.

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, and present at least a B average. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, and physics. At the same time, all candidates will be required to demonstrate special competence in nuclear design.

Specific course requirements for the Ph.D. in Nuclear Engineering include:
1. A minimum of 48 semester hours beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 24 semester hours in doctoral research.
3. A minimum of 30 semester hours in nuclear engineering courses numbered 500 and above (or the equivalent), with at least 9 semester hours of 600-level courses. These are exclusive of 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 8 semester hours in nuclear engineering courses numbered 500 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.
6. A reading knowledge of one foreign language may be specified by the student's doctoral committee.

The comprehensive examination is prepared by the student's 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 course work. A student who fails the written part of the examination must take and pass the examination before the next time it is offered. Students may not remain in the Ph.D. program. Registration for NE 600 Dissertation is not permitted until the written examination is passed. The comprehensive examination is completed with a successful oral defense of the dissertation proposal.

A candidate must successfully defend, in an oral examination, all work presented for the degree—all course work and dissertation.

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.

401 Nuclear Reactor Theory (3) Thermal and fast spectrum computational methods, homogeneous and heterogeneous methods. Equations that relate thermal and neutronic variables, power distribution calculations, and reactivity control methods. Prereq: 302.

403 Nuclear Engineering Laboratory (3) Cross-section measurement, diffusion properties of neutrons, critical loading experiment, control rod calibration, statistical weight, shielding, xenon poisoning, dynamics and controls experiments. Prereq: 304 or equivalent. Coreq: 401, 405 or equivalent.


406 Radiation Shielding (3) Types of radiation sources, fundamentals of gamma ray and neutron attenuation, biological effects, approximate methods of shield design, discrete ordinates, and Monte Carlo. Prereq: Physics 232.

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.)

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

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

511-12 Transport Processes in Nuclear Engineering (3.3) Rheology of nonNewtonian 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, solute, fluid and heat; conservation 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 design of these methods to nuclear plant dynamics, simulation and control problems.

531 Nuclear Systems Reliability (3) Qualitative and quantitative techniques for assessing and improving nuclear systems capability and safety. Fault tree analysis and associated dependent failure analysis.

541 Reactor Fuel Management (3) Topics relative to in-core fuel management. Applicable topics in reactor physics, fuel depletion, isotopic inventories, reactivity control and numerical methods. Prereq: 401.


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

561-12 Selected Topics in Reactor Theory (3,3) Transport theory, control rod theory, stochastic methods. Selected topics from literature. Prereq: 572.

561 Plasma Engineering II (3) Detailed modeling of plasma breakdown, start up, burn dynamics. Prereq: 564.

562 Special Topics in Fusion Engineering (3) Selected advanced topics in plasma engineering and fusion reactor engineering and technology. Prereq: 651.


Nursing
(College of Nursing)

MAJOR

DEGREE

Nursing ............................................. M.S.N.

Sylvia E. Hart, Dean

Professors:
D. H. Goodfellow, Ph.D. Peabody;

Associate Professors:
M. M. Davis, Ph.D. Tennessee;
P. G. Droppleman, Ph.D. Tennessee;

Assistant Professors:
M. M. Fenske, Ph.D. Vanderbilt; D. Shoffner M.S.N. Tennessee; S. M. Thomas, Ph.D. Tennessee.

The College of Nursing offers the Master of Science in Nursing with concentrations in adult health nursing, parent-child nursing, mental health nursing, and primary care nursing. See college description for additional information.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.

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 MSN 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 Aptitude 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 letters of reference or evaluation.
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:

- Pharmacology: 301
- Acute Care Nursing: 312
- Family Health Nursing: 402
- Psychosocial Long Term Nursing: 412

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 and a written thesis. For non-thesis students, the written examination will cover the entire program of study and may, at the discretion of the student’s committee, be followed by an oral examination.

SPECIAL POLICIES

1. Students must maintain a 3.0 GPA throughout the program. If the GPA for all graduate level courses is less than 3.0 after 20 credit hours are completed, the student will be required to withdraw from the program.

2. If the clinical performance of any student for any course is found to be unsatisfactory, the student will receive a grade of 'F' for the course.

3. If a student achieves a final grade of 'D' or 'F' for any required undergraduate nursing course, he or she will not be permitted to repeat the course and will be required to withdraw from the program.

4. If the clinical performance of any student is characterized by unethical, unprofessional or unsafe behavior, or behavior that places the client in jeopardy, the student will be required to withdraw from the program.

REQUIREMENTS FOR SECOND MASTER'S DEGREE

1. Students must complete 40 semester hours at the graduate level with a cumulative GPA of 3.0 unless they already have Master’s or doctoral degrees. Those who already hold a Master's or doctoral degree may apply up to 9 semester hours from that degree to meeting MSN program requirements. In order to apply these hours to the MSN degree, the following criteria must be met:
   a. The courses utilized must be relevant to the MSN.
   b. The credits must have been earned within the time limits established for the MSN.
   c. The utilization of these courses must be approved by the student’s committee, by the Dean of the College, and by the Dean of The Graduate School.

2. Regardless of the specific courses transferred in order to reduce degree requirements, the following distribution of required nursing courses must be completed:
   - Core: 12
   - Clinical Concentration: 11

Role Preparation

- Research: 3
- 500 Thesis (1-15) F/P/NP only
- 501 Nursing Research: Methods, Design, and Analysis (3) Methodology, 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: 313. Prereq or coreq: Graduate level statistics course. 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: SYNC only. E
- 503 Holistic Nursing I (3) Examination of philosophy of holistic nursing and new paradigms for nursing assessment, diagnosis, and intervention. Exploration and application of principles of health promotion, education, and innovative strategies for achievement of wellness. Prereq: BSN degree, MSN student, or consent of instructor. F
- 504 Holistic Nursing II (3) Continuation of 503. Holistic nursing modalities utilized to provide nursing care to clients, families, and community groups. Clinical practice experience with clients experiencing deviations from wellness. Prereq: 503, 4 hrs and 1 lab. F
- 505 Advanced Pharmacology (3) Pharmacological agents utilized to treat common, recurrent health problems; indications, contraindications, side and interactive effects of commonly prescribed drugs. Prereq: 501 or equivalent or consent of instructor. F
- 509 Graduate Seminar in Public Health (1) (Same as Public Health 509, Social Work 509, Physical Education 509, Nutrition and Food Sciences 509.)
- 510 Theoretical Foundations of Nursing (2) Historical evolution of nursing science; examination and critical analysis of nursing's metaparadigm and selected conceptual models, philosophies, and theories; contemporary ethical theories and application to nursing practice diemmas. Prereq: MSN student or consent of instructor. F
- 520 Nursing Resource Management (2) Selected organizational, conflict-management, decision-making, leadership, professional, technological, and other theories, principles, and concepts to advanced clinical nursing practice. Prereq or coreq: 504. F
- 530 Adult Health Nursing I (6) Exploration and application of advanced nursing, physiological, developmental, and psychosocial theories to nursing care and management of clients and their families who are experiencing episodes of acute and chronic illnesses and related crises; role of clinical nurse specialist in helping clients and families achieve optimal health. Prereq: 501, 504, 510. 2 hrs and 4 labs. F
- 531 Adult Health Nursing II (5) Continuation of 530. Role of clinical specialist in providing and managing nursing care for acutely and chronically ill adults across life span; analysis and utilization of nursing and health-related research in practice settings. Prereq: 530. 2 hrs and 5 labs. Sp
- 541 Family Nurse Practitioner II (5) Continuation of 540. Management of chronic health problems; clinical experiences in variety of settings. Prereq: 540. 3 labs. Sp
- 550 Parent Child Nursing II (6) Exploration and application of selected advanced nursing, physiological, psychological, developmental, and other theories, principles, and concepts to child-bearing or child-rearing families in acute care or community settings; family health promotion and interventions designed to recognize and respond to threats to health of mothers and children. Prereq: 501, 504, 510. 2 hrs and 4 labs. F
- 560 Mental Health Nursing I (6) Exploration and application of advanced theories of therapeutic intervention to clients experiencing mental health problems. Options for clinical practice with clients of various age groups in acute care or community facilities. Prereq: 501, 504, 510. 2 hrs and 4 labs. F
- 561 Mental Health Nursing II (5) Continuation of 560. Families and groups with mental health problems. Prereq: 560. 2 hrs and 3 labs. Sp
- 562 Specialty Field Work and Seminar (5) Seminar suitable for a clinical or practice designed to facilitate further development of specialized knowledge and skills utilized for advanced clinical practice; required for all students who select research paper in advanced clinical practice. Prereq: 530, 540, 550, or 560. Prereq or coreq: 531, 541, 551, or 561. 1 hr and 4 labs. Sp
- 563 Teaching Strategies and Practicum (5) Exploration, analysis, and application of selected educational, curriculum, teaching-learning, measurement, and evaluation principles and theories to instruction of undergraduate nursing students; teaching practicum in college level institution. Prereq: 501, 541, 551, 561. 3 hrs and 2 labs. Sp
- 564 Nursing Management: Strategies and Practicum (5) Exploration, analysis, and application of selected advanced management, supervisory, organizational, leadership, and other theories and concepts to administration of nursing services; management practicum in nursing service facility. Prereq or coreq: 531, 541, 551, 561. 3 hrs and 2 labs. Sp
- 577 Special Topics (3) Topic is determined by faculty and student interest. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F
- 580 Nursing Project (3-15) Research-oriented, student-initiated endeavor that culminates in scholarly paper and a nursing research project; project may take form of development of innovative nursing intervention program, comprehensive literature review that reflects synthesis or comprehensive analysis of 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. Sp
- 593 Independent Study (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F

Nutrition and Food Sciences (College of Human Ecology)

MAJORS

- DEGREES
- Food Science: M.S.
- Nutrition: M.S.
- Food Systems Administration: M.S.
- Human Ecology: Ph.D.

Betty Ruth Carruth, Head

Professors:
- R. E. Beauchene, Ph.D. Kansas State
- B. R. Carruth, Ph.D. Missouri; H. W. Quinton, Ed.D.
- J. T. Smith, Ph.D. Missouri
- M. A. Smith (Memphis), Ph.D. Tennessee

Associate Professors:
- W. C. Morris, Ph.D. Iowa; D. S. Sachan, Ph.D. Illinois; M. N. Traylor, M.P.H. California (Berkeley)
Assistant Professors:
J. B. Bittle (Memphis), Ph.D. Tennessee; M. D. Brooks (Memphis), M.S. Alabama; B. Haughton, Ed.D. Columbia; P. Reddinger, Ph.D. Kansas State; J. D. McMahon, Ph.D. Oregon State; J. P. Sneed, Ph.D. Ohio State.

Instructor:
M. McGrath, M.S. Purdue.

Master of Science programs are available in Nutrition, Food Science, and Food Systems Administration. Within the Nutrition program, a student may choose a concentration in nutrition science or public health nutrition.

ADMISSION REQUIREMENTS
Admission into any of the graduate programs in the department is dependent on completion of undergraduate courses that give the necessary background for success in the graduate program. For all programs in Nutrition Science and Food Science, courses in general and organic chemistry, physiological chemistry, food and clinical analysis, microbiology, mathematics, physiology, economics, science of food, and nutrition are essential. For the Master’s program in food systems administration, undergraduate courses in food service systems administration, quantity food production, cost control, and personnel development are essential. In addition, students with work experience will be given preference.

THE MASTER’S PROGRAM

Nutrition
In Nutrition, students may choose a thesis or non-thesis option. Students emphasizing public health nutrition must choose the non-thesis option. Nutrition students who choose the non-thesis option must take 515 or 541 and 2 hours from 542-544, which are designed as courses in which the student will integrate knowledge from course work and write a major paper upon completion of an individual project.

Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of course work in the department. NFS 503, 504, 511, and 512 are required. Six hours of NSF 500 are required and may be applied toward the 33 hours. Six hours outside the department are recommended. A minimum of 22 hours at the 500 and 600 level is required.

Non-Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of course work in the department. NFS 503, 504, 511, 512, 541, and 544 or 545 are required. Six hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is required upon completion of the thesis.

Food Systems Administration
In Food Systems Administration, students may choose either the thesis or non-thesis option. Food Systems Administration students who choose the non-thesis option must take 541, 546 and 3 hours from 548, which are designed as courses in which the student will integrate knowledge from course work and write a major paper upon completion of an individual project.

Thesis option: The program consists of a minimum of 33 hours with at least 16 hours of course work in the department. NFS 503, 504, 511, 512, 541, and 544 are required. Six hours of thesis 500 are required and may be applied toward the 33 hours. Six hours outside the department are recommended. A minimum of 22 hours at the 500 and 600 level is required.

An oral comprehensive examination is required upon completion of the thesis.

Non-Thesis Option: The program consists of a minimum of 33 hours with at least 16 hours of course work in the department. NFS 540, 541, 546, and 3 hours from 548 (non-thesis research project) are required. Six hours in one area outside the department are required. A minimum of 24 hours at the 500 and 600 level is required.

A written comprehensive examination is given at the end of the program.

THE PH.D CONCENTRATION
Students enrolled in the food science concentration specialize in either the physico-chemical or socio-cultural aspects of food in relation to people and their environment. Students are expected to develop strength in nutrition and other fields by taking courses in a cognate area. Food systems administration, food technology, education, and the natural and behavioral sciences are among the potential cognate areas. The nutrition science concentration enables students to study the science of nutrition from the cellular level to the application of nutritional principles by people in a changing environment.

In either concentration, students may specialize in nutrition education, using nutrition and food science as foundation areas, and incorporating the study of food habits and factors that influence dietary change. Cognate areas could include sociology, education, anthropology, and nutritional sciences. Students are expected to acquire advanced training in food science, education, anthropology, and to acquire skills for conducting research in human nutrition, experimental nutrition (small animals), and intermediary metabolism.

Requirements for both concentrations:
1. Sixteen hours with a concentration in food science or nutrition including 9 hours at the 600 level (exclusive of dissertation).
2. NFS 511, and 512, 503 or 504 (nutrition science concentration) or 503 and 504 (food science concentration).
3. Minimum 4 hours of NFS 540.
4. Minimum 9 hours of statistics, computer science and research methods.
5. Minimum 6 hours in a cognate area.
6. Students without college teaching experience are required to take the fall semester seminar for GTAs and NFS 548 comprising a faculty-supervised problem in college teaching.

413 Experimental Food Science (3) Individual and group laboratory experiments in food science; microcomputer applications. Prereq: 312, Plant and Soil Science 471. 1 hr and 2 labs. F

414 Nutrient-Drug Interactions (2) Nutritional effects of efficacy and toxicity of drugs; drug effects on absorption and metabolism of nutrients. Prereq: 300 or equivalent. Sp, A

423 Foodservice Systems Design and Equipment (3) System facility design; production and delivery systems; equipment selection and purchase. Prereq: 331 or consent of instructor. A

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

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

503 Physicochemical Properties of Foods I (3) Proteins and lipids: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413. F, A

504 Physicochemical Properties of Foods II (3) Sugars, starch, and non-starch polysaccharides; hydrocolloids; and pigments: physical and chemical characteristics; behavior in foods. Prereq: 201 or equivalent. 413, F, A

505 Food Texture Classification of foods according to textural parameters; instrumental and sensory methods; evaluation of texture. Prereq: 413 or Food Technology and Science 411, statistics or consent of instructor. 1 hr and 1 lab. Su

506 Sensory Analysis Principles and methodology for sensory evaluation of food; application to laboratory and consumer panels; interpretation of data. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F

508 Culture, Food, and Nutrition Food-related behavior of individuals and cultural groups in the United States; sociocultural, economic, and technological influences. Nutrition and food surveys, public policy. Prereq: 301 or 313 or consent of instructor. F, A

509 Graduate Seminar in Public Health (1) Same as Public Health 509, Nutritional 509, Physical Education 509 and Social Work 509.

511 Advanced Physiological Chemistry (4) Bioenergetics, flux control and hormonal interrelationships. Prereq: 513 or equivalent. F

513 Community Nutrition (3) Orientation to community; assessment of needs; diet and nutrition, role of nutrients, and their functions in health; identification of professional opportunities in the field. Prereq: 115 or consent of instructor. F

514 Community Nutrition (3) Planning, implementation, and evaluation of public health nutrition programs. Concurrent field experiences. Prereq: 513 or consent of instructor. Sp

515 Field Study in Community Nutrition (1-12) Personal participation and analysis of state or regional community nutrition program. Location of in-depth study to be selected in consultation with instructor. Prereq: 514 and consent of instructor. Su

516 Maternal and Child Nutrition (3) Nutrition principles related to growth and development during pregnancy, infancy, and childhood to age 5, high risk conditions. Prereq: 313 or consent of instructor. F

517 Childhood and Adolescent Nutrition (3) Application of nutrition principles to school-age children; effects of diseases on growth and health maintenance; nutritional assessment and counseling for nutrition. Prereq: 313 or consent of instructor. Sp

518 Nutrition and Aging (3) Nutritional problems of adults; nutritional requirements, dietary intakes; affects of nutrition on biological aging. Prereq: 313 or consent of instructor. Su

519 International Nutrition (3) World food supply, demographic, sociocultural, economic, and technological factors that affect nutrition; international intervention and assistance programs. Prereq: Consent of instructor. F, A

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: 411 or consent of instructor.

522 Nutrition Counseling (2) Individual eating habits and disorders, evaluation strategies for effectiveness of helping process. Prereq: 313 or consent of instructor. F, A

523 Nutrition and Behavior (2) Influence of nutrients on intracerebral metabolic processes, electro-physiological indicators of brain function and behavior of individuals: sensory, motor, intellectual, and personality aspects. Prereq: Consent of instructor. Su

524 Nutrition Education: Principles, Implementation, and Evaluation (3) Conceptual models, principles, application, and evaluation models in nutrition education research. Prereq: 508 or consent of instructor. Su, A

525 Educational Activities (4) Prereq: Consent of instructor.

526 Mental Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all full-time students in training at Child Development Center, UT, Memphis. Supervised project in related area. Prereq: Consent of department head.

527 Nutrition in the Mentally Retarded and Other Developmental Disorders of Childhood (3-9) Interdisciplinary diagnosis and treatment of developmentally handicapped child; role of nutritionist; clinical experiences and lectures at Child Development Center, UT, Memphis. Prereq: Consent of department head.

529 Management in Nutritional Care (2) Administrative roles and management functions of dietitians in clinical settings: program development, planning, and evaluation. Prereq: 220, 422, or consent of instructor.

530 Computer-Assisted Foodservice Systems Management (3) Application of computer technology to foodservice industry, inventory, food cost accounting, production, and nutrient analysis. Prereq: 320 or consent of instructor. Su, A

531 Financial and Marketing Administration in Foodservice (3) Marketing and financial techniques used in foodservice industry, developing foodservice marketing plan, budgeting, foodservice accounting and information services. Prereq: 326 or consent of instructor. Sp

532 Human Resource Management in Foodservice (3) Identifying labor needs; development and maintenance of work force. Prereq: 422 or consent of instructor. F

533 Advanced Food Production and Delivery System Management (3) Analysis of food production and delivery systems: application of quantitative methods and models to optimize decisions. Prereq: 320 or consent of instructor. F

534 Special Topics in Foodservice Systems Administration (1-3) Lecture/discussion format. Contemporary developments and trends in industry. Prereq: Consent of instructor. May be repeated. E

535 Directed Study in Foodservice Systems Administration (1-12) Problems selected for study by student with guidance of faculty member. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

537 Seminar in Foodservice Systems Administration (1) May be repeated. S/NC only. Sp

540 Seminar in Nutrition and Food Sciences (1) May be repeated. S/NC only. E

541 Research Methods (1) Basic principles of planning, conducting, and interpreting nutrition, food sciences, and foodservice systems administration research. Prereq: 5 graduate hours in nutrition and food sciences and statistics. Sp

542 Advanced Experimental Nutrition (2) Application of research principles to individual project using experimental animals. Prereq or coreq: 541. Sp

543 Human Metabolic Research Methods (2) Application of research principles to conducting and interpreting metabolic study. Prereq or coreq: 541. Sp

544 Food and Nutrition Survey (2) Project for assessment of food consumption, nutrient intake, nutritional status, and sociocultural economic parameters in populations. Prereq or coreq: 541. Sp

545 Advanced Experimental Food Science (2) Application of research principles to individual food science study. Prereq or coreq: 541. 2 labs. Sp

546 Foodservice Systems Administration Research Methods (2) Application of research methods to development of proposals for individual foodservice industry-related research projects to be completed in 548. 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/NC only. E

548 Directed Study in Nutrition and Food Sciences (1-3) Advanced study in nutrition and food sciences. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

549 Special Topics (1-3) Recent advances in nutrition, food science, food systems administration and hospitality industry; implications for professionals. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

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

601 Advanced Topics in Food Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: 503 or 504, consent of instructor. May be repeated. F

602 Advanced Topics in Nutrition Science (1-3) Comprehensive individual study and group discussion of topics related to current problems in nutrition. Prereq: 512 or consent of instructor. May be repeated. F

603 Current Trends in Food and Sociocultural Change (2) Critical evaluation of research. Prereq: 508, 541, 544, graduate-level statistics. Su, A

Ornamental Horticulture and Landscape Design (College of Agriculture)

MAJOR DEGREE

Ornamental Horticulture and Landscape Design............M.S.

G.Douglas Crater, Head


Associate Professor: J. W. Day, Ph.D. Mississippi State.

Assistant Professors: S. M. Rogers, M.L.A. Georgia; R. Trigiano, Ph.D. North Carolina State.

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 science and technology interests such as micropropagation, innovative ornamental plant production systems, and computer aided maintenance and production management systems can be emphasized in any of the areas of concentration by judicious selection of courses and research objectives for the thesis.

For admission, the student must have a B.S. in ornamental horticulture, horticulture, plant science, or a closely related agricultural or basic science discipline and must have the undergraduate transcript evaluated by the department for prerequisite requirements. If any of the research assistantships are available on a competitive basis. For further information, contact the department head.

THE MASTER'S PROGRAM

Thesis Option

1. A thesis is required. A Master's committee of no fewer than 3 faculty members will be selected. Prior to research for the thesis, a proposal must be approved by the Master's committee. Registration for a minimum of 6 hours of Thesis 500 is required.

2. In addition to the thesis requirement, a minimum of 24 hours of graduate credit(13,6),(992,995) 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 course work if the student's progress or background indicates such need.

3. All students are required to include 2 hours of 590 Seminar in their program and are expected to attend this course and par-
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 219, 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; physiological influences of clipping and water management; design, construction and management of golf courses; and physiological influences of pest infection and control measures. Prereq: 340 or consent of instructor. 3 hrs and 1 lab. Sp

460 Professional Practices in Landscape Construction and Management (2) Professionalism, salesmanship, proposals, bidding, estimating, specification, and contract management in landscape services industry. Interaction with industry representatives through special presentations. Prereq: 550 or consent of instructor. 4 hrs. E

480 Advanced Landscape Design (4) Comprehensive application of landscape design skills. Design application of landscape design and design drafting, applied landscape construction, planting design, analysis, programming, design, detailing, estimating, and specifying applicable to variety of landscape projects. Prereq: 280, 350, and 380, or consent of instructor. 1 hr and 2-3 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. Maximum 3 hrs. Sp,A

510 Research Methods in Ornamental Horticulture and Landscape Design (3) Current problems: methods of conducting research on ornamental plants. Required of all students in Master’s program. Prereq: Plant and Soil Science 471, F.


550 Microtechnique (3) Methods of investigating histotechnology, histochemistry, ploidy, and pathological structures in ornamental and crop plants, light microscopy. Prereq: 8 hrs biological science, 8 hrs chemistry, and consent of instructor. 1 hr and 2 labs. Su

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, thermoperiodism, 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 analysis in production of ornamental crops. Comprehensive study of functional roles of nutrients essential to plant growth; critical evaluation of recent developments in nutrient sources and formulations, foliar fertilization and analysis, 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. Sp,A

590 Seminar (1) Current literature and developments. May be repeated. Maximum 3 hrs. E

593 Problems in Ornamental Horticulture and Landscape Design (1-3) Independent study. Current topic related to technology and science. May be repeated. Maximum 6 hrs. E

### Pathobiology (College of Veterinary Medicine)

**MAJOR**

**DEGREE**

VETERINARY MEDICINE D.V.M.

- **R. L. Michel, Head**

**Professors:**

- M. D. McGavin, Ph.D. Michigan State
- R. L. Michel, V.M.D. Pennsylvania, Ph.D.
- Michigan State
- L. N. D. Poigtieri, Ph.D.
- Iowa State
- H. M. Schuller, D.V.M. Justus Leibig (Germany)
- Ph.D. Hannah (Germany)

**Associate Professors:**

- D. F. Edwards, D.V.M. Georgia
- M. D. McCracken, D.V.M. Kansas State
- Ph.D. Purdue, S. Patton, D.V.M. Ohio State
- S. Patton, Ph.D. Kentucky

**Assistant Professor:**

- M. A. Breider, D.V.M. Oklahoma State, Ph.D.
- Texas A & M

**Instructor:**

- G. M. del Fierro, D.V.M. Philippines

**Residents:**

- R. B. Duncan, D.V.M. Ohio State
- S. L. Vanhooser, D.V.M. Texas A & M

See Veterinary Medicine for Program Description.

### PROFESSIONAL COURSES

**871 General Pathology (4)** Principles of pathobiology: causative agents, disturbances of cell growth, inflammation, and neoplasia.

**873 Parasitology (3)** Principles of parasitology: protozoology, helminthology, and entomology and relationship to diseases in animals.

**875 Clinical Rotations in Pathobiology (2)** Clinical training and demonstrations in laboratory diagnosis: post-mortem examination and clinical, histologic, parasiologic and microbiologic techniques.

**876 Clinical Rotations in Pathobiology II (2)** Clinical training and demonstrations in laboratory diagnosis: post-mortem examination and clinical parasitologic and microbiologic techniques.

**877 Special Problems in Pathobiology (1-4)** Extramural and specially designed study for students interested in select topics in morphologic pathology, clinical pathology, clinical microbiology and parasitology.

### GRADUATE COURSES

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

**501 Special Topics in Pathobiology (1-2)** May be repeated. Maximum 6 hrs. E

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

**503 Comparative Pathology (3)** Pathogenic mechanisms. Comparative aspects of parasitic, infectious, and ultrastructural lesions. Prereq: Histology, 2 hrs and 1 lab. F,A

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

**601 Advanced Topics in Pathobiology (1-3)** Necropsy, histopathology, clinical pathology, clinical parasitology, clinical immunology, clinical bacteriology and mycology, and clinical virology. May be repeated. Maximum 12 hrs. E

**602 Veterinary Biopsy (1-2)** Examination of biopsy specimens and interpretation of observations. Preparation of specimens for sectioning. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

**603 Correlative Post-Mortem Pathology (1-3)** Gross and microscopic post-mortem examination of animals. Correlative interpretation of clinical diseases and lesions. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

**604 Veterinary Pathology Seminar (1)** Microscopic slides and transparencies of lesions from cases examined by pathologists, residents, and graduate students. Interpretation of observations. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. E

**605 Pathology Seminar (1)** Subjects of current interest in veterinary medicine. Students present one seminar per term endowed. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. Class meets once monthly. E

**606 Ultrastructural Pathology (1)** Ultrastructural changes in diseased cells, interpretation of observations. Prereq: Professional medical degree or consent of instructor. Sp,A

**607 Diagnosis and Pathogenesis of Virus Diseases of Domestic Animals (3)** Advanced study of virus diseases important to domestic animals: virus biology, pathogenesis, pathology and diagnosis. Technical training in virus diseases diagnosis. Prereq: Cellular and Comparative Biochemistry, and Advanced Topics in Biochemistry, Virology and Virology Lab, or Microbiology-Veterinary Medicine 811-812. 2 hrs and 1 lab. Sp,A

**608 Techniques in Pathology (2)** Fixation, processing and staining of tissue specimens; specialized gross dissection techniques; photography of gross specimens and photomicrography. Prereq: Consent of instructor.

**609 Principles of Pathology (1)** Advanced topics in pathology and mechanisms of disease: pathophysiology in cellular degeneration, inflammation, immunopathology, hemostasis. Principal biochemic and morphologic responses of various cells, tissues, and organs to injury and other metabolic derange-
Doctoral students must demonstrate competency in one foreign language, normally French or German. This may be done by passing the doctoral language examination administered by the Romance Language or German Departments, or by passing French 302 or German 332 with a B or better. In special circumstances and upon petition by the student, the Department's graduate committee may approve a substitute language for French or German.

**SPECIAL CONCENTRATIONS**

**Medical Ethics**

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Detailed information concerning the program can be obtained from either the Director of Graduate Studies in Philosophy or the Director of the Medical Ethics Program.

**Religious Studies**

The department has an M.A. program of graduate study with a concentration in religious studies. Details concerning the program may be obtained from either the Director of Graduate Studies in Philosophy or the Department of Religious Studies.

**400 Special Topics** (3) May be repeated when topic varies. Maximum 6 hrs.

**411 Modern Religious Philosophies (3)** (Same as Religious Studies 411.)

**412 Classical Indian Systems of Philosophy: The Moksha Tradition (3)** (Same as Religious Studies 412.)

**420 Topics in History of Philosophy (3)** Figures or movements in the history of philosophy. Prereq: 8 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 9 hrs.

**425 American Philosophy (3)** Colonial to early 20th Century. Prereq: 6 hrs of philosophy or consent of instructor.

**430 Topics in Logic (3)** Prereq: 6 hrs of logic or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

**440 Contemporary Ethical Theory (3)** Topics in meta-ethics or ethics. Prereq: 8 hrs of philosophy or consent of instructor.

**446 Theoretical Issues in Medical Ethics (3)** Prereq: 240 or 345 or consent of instructor. (Same as Religious Studies 446.)

**460 Philosophy of Science (3)** Methodological and conceptual issues in natural and social sciences: patterns of theory modification and replacement, nature of explanation and causation, status of theoretical entities. Prereq: 380 and 1 yr of natural or social science, or consent of instructor.

**465 Philosophy of History (3)** Speculative and critical aspects of philosophy of history. Prereq: 6 hrs of philosophy or consent of instructor.

**473 Philosophy of Mind (3)** Problems of mind and body in relation to consciousness and personal identity. Prereq: 6 hrs of philosophy or consent of instructor.

**475 Analytic Metaphysics and Epistemology (3)** Topics in metaphysics and epistemology in recent Anglo-American tradition. Prereq: 6 hrs of philosophy or consent of instructor.

**476 Philosophy of Language (3)** Survey of issues such as meaning, reference, and truth. Prereq: 6 hrs of philosophy or consent of instructor.

**479 Studies in Recent Continental Philosophy (3)** Selected thinkers or topics: existentialism, phenomenology, hermeneutics, structuralism, post-structuralism. Prereq: 8 hrs of philosophy or consent of instructor. May be repeated when topic varies. Maximum 6 hrs.

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

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

**520 Topics in the History of Ancient and Medieval Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**522 Topics in the History of Modern Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**524 Topics in the History of Twentieth-Century European Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**527 Topics in the History of American Philosophy (3)** Intensive critical work on major philosopher or school. May be repeated. Maximum 9 hrs.

**530 Topics in Logic and Philosophy of Mathematics (3)** May be repeated. Maximum 9 hrs.

**540 Topics in Value Theory (3)** May be repeated. Maximum 9 hrs.

**542 Ethics (3)** Dominant movements in history of ethics. May be repeated. Maximum 9 hrs.

**544 Applied Ethical Theory (3)** Single author, tradition, or topic in ethical theory, application to issues in health, business, technology, ecology, and other practical fields. May be repeated. Maximum 9 hrs. (Same as Religious Studies 544.)

**546 Orientation to Medical Ethics (3)** Survey of ethical theories in application to issues in medical ethics. Prereq: Consent of Medical Ethics Committee.

**547 Clinical Medical Ethics (2)** Medical terminology, history of medical ethics, case study discussion, clinical observation. Open only to students concentrating in medical ethics. May be repeated. Maximum 4 hrs.

**548 Clinical Residency in Medical Ethics (3-9)** Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics Committee. E

**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.

**562 Philosophy of Social Sciences (3)** Nature of subject matter and method of science. May be repeated. Maximum 9 hrs.

**570 Philosophy of Religion (3)** Examination of central problems. (Same as Religious Studies 570.)

**575 Topics in Metaphysics and Epistemology (3)** May be repeated. Maximum 9 hrs.

**577 Philosophy of Mind (3)** Relation of mental to physical and of role of words in discourse for mental activities, thinking and feeling. May be repeated. Maximum 9 hrs.

**590 Social and Political Philosophy (3)** Philosophical problems concerning social and political life: family, state, freedom, justice; major theoretical responses: anarchism, socialism, Marxism. May be repeated. Maximum 9 hrs.

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

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

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

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

(Original)
graduate courses in human physiology of exercise.
Coreq: 561.

561 Physical Fitness Testing and Evaluation (1) Laboratory; testing and evaluation of physical fitness factors in apparently normal population. Coreq: 560.

562 Advanced Physiology of Exercise (3) Laboratory; quantitative approach to scientific inquiry. Prereq: Undergraduate physiology of exercise.


569 Fitness Testing, Programming, and Leadership for Diverse Populations (1) Clinical experience in selecting, administering, and evaluating exercise tolerance tests on cycle ergometer and treadmill. Individual fitness programs for diverse populations. Practice in leading variety of activities aimed at improved fitness. Prereq: 560. Coreq: 568. (Same as Public Health 569.)

593 Directed Independent Studies (1-3) May be repeated. Prereq: 532 or consent of instructor.

600 Doctoral Research and Dissertation (1-15) S/NC only. E

601 Research Seminar in Physical Education (1) Research topics in different aspects of physical education, sport, and human movement. May be repeated. S/NC only.

622 Directed Independent Research (3-6) Prereq: Doctoral student or consent of instructor. May be repeated.

633 Advanced Motor Behavior (1-3) In-depth analysis, synthesis, and discussion of contemporary theory and topics; research development and production; motor control learning, sport psychology, motor development.

661 Seminar in Exercise and Applied Physiology (1) Prereq: 561. May be repeated with consent of instructor. S/NC only.

664 Research Participation in Applied Physiology (1-6) Participation in research with faculty member whose interests coincide with those of student. S/NC only.

681 Practicum (1-3) Intern experience in areas of major interest. May be repeated.

Dance

410 Ballet: Level III (2) Instruction and practice in advanced classical ballet technique. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

415 The Teaching of Creative Dance (2) Theory, methods, materials, and practical experience in presentation and integration of creative dance in grades K-6.

420 Jazz: Level III (2) Instruction and practice in advanced jazz and musical theater dance styles and techniques. Prereq: Dance majors and minors and consent of instructor. May be repeated. Maximum 16 hrs.

430 Modern: Level III (2) Instruction and practice in advanced modern dance techniques. Prereq: Dance majors and minors or consent of instructor. May be repeated. Maximum 16 hrs.

450 Composition III (3) Application of choreographic and production skills culminating in presentation of two works. Prereq: 350.

460 Rhythmic Analysis (3) Basic nature and principles of music, rhythm, and rhythmic notation; correlation with dance movement and composition. Prereq: Consent of instructor.

465 Dance Notation (3) Fundamentals of movement notation; notation and reading of elementary movement studies.

480 History of Dance I (3) Dance of various societies and culture from pre-history through 19th century.

481 History of Dance II (3) Development of dance in theatre, recreation and education during 20th century.

490 Philosophy of Dance and Related Arts (3) Aesthetic principles and current trends in dance; relationship with other art forms.


495 Dance Pedagogy (3) Principles and methods of teaching of dance with practical application in mind-teaching experience. Prereq: Upperclass or graduate standing and consent of instructor.

Physics and Astronomy

(Majors in Liberal Arts)

Majors in Liberal Arts

DEGREES

William M. Bugg, Head

Professors:

C. R. Bingham, Ph.D. Tennessee;
W. E. Blass, Ph.D. Michigan State;
M. A. Breazeale, Ph.D. Michigan State;
W. M. Bugg, Ph.D. Tennessee; T. A. Calcott, Ph.D. Purdue; L. G. Christophorou, Ph.D. University of Manchester (England);
E. W. Coigazier, Ph.D. California Institute of Technology; T. Collins, Ph.D. Florida;
G. T. Condo, Ph.D. Illinois; W. E. Deeds, Ph.D. Ohio State; J. B. Dicks (Alumni)

Distinguished Professor), Ph.D. Tennessee;
E. L. Hart, Ph.D. Cornell; P. G. Huray, Ph.D. Tennessee;
H. C. Jacobson, Ph.D. Yale;
D. T. King, Ph.D. Bristol (England);
R. J. Lovell, Ph.D. Vanderbilt; G. D. Mahan (Distinguished Scientist), Ph.D. California (Berkeley);
A. A. Mason, Ph.D. Tennessee;
A. H. Nielsen, Emeritus), Ph.D. Michigan;
F. E. Obenshain, Jr., Ph.D. Pittsburgh;
L. R. Painter, Ph.D. Tennessee; D. J. Pegg, Ph.D. New Hampshire; L. L. Riedinger, Ph.D. Vanderbilt; R. H. Ritchie, Ph.D. Tennessee;
H. C. Schweiner (Emeritus), Ph.D. Massachusetts Institute of Technology;
I. A. Sellin (Chancellor's Research Scholar), Ph.D. Chicago; C. C. Shih, Ph.D. Cornell;
P. J. Siemens (Distinguished Scientist), Ph.D. Cornell;
P. H. Stelson, Ph.D. Massachusetts Institute of Technology; J. R. Thompson, Ph.D. Duke; J. O. Thomson, Ph.D. Illinois;

Associate Professors:

J. Braun, Ph.D. Massachusetts Institute of Technology; M. Brenig, Ph.D. Oregon;
W. A. Dunn,* Ph.D. Florida; S. B. Elston, Ph.D. Massachusetts; T. Ferrell, Ph.D. Clemson; T. H. Handler, Ph.D. Rutgers;

Assistant Professors:

J. Burgdorfer, Ph.D. Frie Universitat Berlin; R. DeSerio, Ph.D. Chicago; S. Nave, Ph.D. Tennessee.

*Space Institute, Tulahoma.

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, Tulahoma, where opportunities for study and research are available in quantum optics and laser physics, atomic and molecular spectroscopy, fluid physics, and theoretical physics. For additional information, contact the department head.

ADMISSION REQUIREMENTS

A student who enrolls in The Graduate School with the intention of attaining an advanced degree in Physics will have completed an undergraduate major in Physics or its equivalent. Physics 311-12, 321, 431-32, and 461-62-63 or 411-12 constitute the minimum courses prerequisite to graduate study.

A student who intends to present Physics as a graduate minor will have completed an undergraduate minor in Physics or its equivalent. Physics 311 and 431-32 constitute the minimum course work prerequisite to minor in Physics.

All first-year graduate students are required, for advising purposes only, to take a qualifying examination in undergraduate physics during the fall semester registration period.

THE MASTER'S PROGRAM

Thesis Option

This program is designed primarily for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 24 semester hours of physics courses, of which at least 12 semester hours are taken from Physics 511-12, 521-22, 531-32, 541-42, or 571-72. Each candidate must present an acceptable thesis, 6 hours of 500, and pass an oral examination on course material and thesis.

Non-Thesis Option

This program is designed primarily for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to work toward a Ph.D. Students seeking the non-thesis option must apply to the department's graduate committee for permission to enroll under this program. The requirements are the satisfactory completion of 30 hours of course work composed of 18 semester hours from Physics 511-12, 521-22, 531-32, 541-42, and 571-72; 6 semester
hours in a minor field; and 6 semester hours from other courses numbered above 400 (preferably of advanced laboratory nature.) At least 20 hours must be taken at the 500 level or above. In addition, the candidate must pass a written examination administered by the committee.

THE DOCTORAL PROGRAM

All students are expected to take Physics 521-22, 531, 541-42, 551, 561, 571-72, and 611. Physics 601-02 are normally required of students specializing in atomic physics. Physics 521-22 introduces fundamental physics; Physics 628-29 of students in elementary particle physics; Physics 683-64 of students in plasma physics; Physics 681-82 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 580, 670.

The recommended curriculum for Ph.D. candidates includes Physics 531, 571, and an elective in the first semester; Physics 521, 541, and 571 in the second semester; Physics 522, 542, and 561 in the third semester; Physics 551, 611, and an elective in the fourth semester. Electives are to be chosen in consultation with the student's advisory committee and/or dissertation committee from courses numbered above 500, and at least two from outside the student's area of concentration are recommended before graduation. The first three semesters of this curriculum constitute the core curriculum and are the basis for the departmental comprehensive examination, which is normally taken after two years of graduate study. A Master's degree is not granted.

A reading knowledge of one foreign language in which there exists a significant body of literature is required. German 332 or French 302 with a grade of A or B may be substituted for the corresponding language examination.

The dissertation topic will be chosen with reference to one of the fields in which research facilities can be made available either at The University of Tennessee or at the Oak Ridge National Laboratory 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

411 Astrophysics (3) Development of analytical physical models of galactic structure of universe, stellar and interstellar matter, and planetary systems. Topical and interdisciplinary, consideration of quasars, pulsars, black holes and current developments in field. Acceptable for major credit in physics. Prereq: Physics 232 and consent of instructor.

490 Special Topics in Astronomy (1-3) Topics of current interest in astronomy and astrophysics. Acceptable for graduate credit in physics with consent of department. May be repeated with consent of department. Maximum 9 hrs.

Physics

401 Background of Physics (2) Survey of historical development and philosophical foundations of natural science. Classical theories of gravitation, electromagnetism, and quantum mechanics. Discussion of unsolved questions in physics, experiments of current interest, readings in recent literature, and applications to problems in senior thesis. Recommended for beginning graduate students. Prereq: 401 or consent of instructor.

402 Forefront of Physics (2) Survey of modern developments in physics: various forms of quantum mechanics, quantum electrodynamics and recent theories of particles, special and general relativity. Discussion of unsolved problems in physics, experiments of current interest, readings in recent literature, and applications to problems in senior thesis. Recommended for beginning graduate students. Prereq: 401 or consent of instructor.


421 Modern Optics (4) Transmission of light in uniform, isotropic media; reflection and transmission at interfaces; mathematics of wave motion and interference effects. Rudiments of Fourier optics and holography. Prereq: 431 or 232 and consent of instructor. 3 hrs and 3 labs.

425 Principles of Nondestructive Testing (3) (Same as Engineering Science and Mechanics 425.)

431-32 Electricity and Magnetism (3.3) Electrostatics, magnetostatics, coupled electric and magnetic fields, Maxwell's Equations, electromagnetic waves and radiation. Prereq: 232.


471-72 Health Physics (3.3) Radioactivity, interaction of electromagnetic radiation with matter, radiation quantifiers and units, neutron and gamma radiation, 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: 340 or 341.

490 Senior Seminar (1-3) Topic of current interest. May be repeated with consent of department. Maximum 6 hrs.

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

501 Graduate Research Participation (3) Advanced research participation under the supervision of a 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; subsonic, supersonic and hypersonic flows; continuum, transitional and free molecular flows; pipe flow, nozzle flow and sonic orifice expansion flows; research of axisymmetric flows, shock-tube physics; and an introduction to the method of characteristics and Monte Carlo computational techniques.

506 Experimental Methods (3) Principles, real operational behavior, and hazards of laser types, radiation detectors, photographic film, optical filters, image converters, image displayers, streak cameras, and fast framing cameras; high vacuum systems including cryogenic-based devices, data acquisition systems including synchronous detection, digital electronics methods and micro-computer data acquisition and registration methods.

507 Contemporary Optics (3) Topics in geometrical, physical, wave, and nonlinear optics and introductory laser physics. Extensive use of computer calculations and design of practical and sophisticated optical systems.

508 Laser Physics (3) Mode analysis, stable and unstable resonators, rate equations and population inversion, saturation, relaxation oscillations, fluctuations and noise, laser stability; quantum theory of laser, photon coherence; mode-locking, Q-switching and frequency stabilization; specific laser types: semiconductor and solid-state, excimer, copper vapor and dye lasers.

511-12 Theoretical Physics (3.3) Classical theoretical physics, with limited use of mathematics. Prereq: 512 and 521. Advanced calculus, differential equations, and vector analysis.


551 The Theory of Relativity (3) Geometry of space-time, relativistic electrodynamics, particle mechanics and quantum mechanics. Einstein's field equations, Schwarzschild solutions, the classical test of general relativity. Prereq or coreq: 531 and 542.


in transportation, health, educational, and social planning.

Each student is required to demonstrate competence in his individual research. This may be done in one of two ways:

**Thesis Option** —Complete a thesis for 6 hours credit;

**Non-Thesis Option** —Complete a major study with acceptable documentation. In order to be eligible for the major study option, the student must have completed at least 12 hours of graduate course work in planning with at least a 3.5 cumulative grade point average. The student meeting these criteria may present a proposal to his/her committee for a major study that will include at least 6 hours of subsequent course work. The proposal shall justify the selection of the topic, describe the approach to the study, and describe the nature of the final product.

The topic will normally be expected to reinforce or complement the student’s concentration.

Student academic progress is monitored by the faculty. A student failing to maintain an acceptable grade point average may be placed on probation or dismissed from the program.

---

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 planning; U.S. experience in urban and other levels of planning. State of the art, process, comprehensive plan, implementation devices. Planning issues in society. Not for credit for M.S.P. degree.

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


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

510 Fundamentals of Planning (2) History of planning, structure and development of urban areas, operation 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 microcomputers in planning and government.

522 Computers in Planning II (3) Software and systems for planning and local government. Content varies. Projects in small group or individual study mode. Prereq: 521 or consent of instructor.

523 Statistics for Planners (3) Applications of basic descriptive and inferential classical and non-parametric techniques in planning research. Data organization and display, fundamental concepts of location, dispersion and association; data transformations; some basic probability theory; selected one and two sample tests; correlation and regression analysis. Prereq: 520 or consent of instructor.

524 Advanced Data Analysis (3) Applications of statistical data analysis in planning. Regression analysis, plus selected multivariate, non-parametric, and analytical graphic techniques. Use of computer packages for data analysis. Prereq: 521, 523 and consent of instructor.


526 Library Research for Planning (1) Survey of publications of interest to planners, resources and research techniques. Use of facilities and collections of library.

530 Planning Analysis and Forecasting (3) Methods of quantitative analysis and forecasting, urban and regional studies. Population, employment, and economic base studies, forecasting techniques. Coreq: 520 or consent of instructor.

531 Urban and Regional Analysis (3) Past, present and possible future patterns of urban and regional structures drawing on contemporary theories, models, and empirical research.

532 Planning Methods (5) Preparation of comprehensive plans for urban areas or regions. Development of baseline data and forecasts, formulation of alternative plans and strategies, and development of plan implementation programs. Extensive laboratory experience. Prereq: 510, 520, 530 and 531 or consent of instructor.

537 Planning and Transportation (3) (Same as Civil Engineering 558.)

538 Urban and Site Design (3-6) Principles of design of residential subdivisions and some components of physical community, shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience.

539 Planning for Historic Preservation (3) Planning for preservation, restoration, and improvement 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 redevelop-

ment. Prereq: 510 or consent of instructor.


551 State and Regional Planning (3) Theory and practice of planning at state, sub-state, and metropolitan levels.

552 Development Planning in the Third World (3) Seminar on urban and regional development in Third World nations. Population growth, settlement patterns, economic development, land framework of integrated resource management. (Same as Ecology 552.)

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

554 TVA, Planning and Development (3) Review and evaluation of leading U.S. national experiment in river basin planning and development. Tennessee Valley Authority.

555 Environmental Planning (3) Role of planners and planning in maintenance of balance between natural and built environment. (Same as Ecology 555.)

560 Policy Analysis and Strategic Planning (3) Models of policy making process and role of strategic planning and applied decision making. Quantitative and qualitative approaches for the graduate and program evaluation, and impact assessment.

590 Practicum (6) Prereq: Consent of instructor. S/NC or letter grade.

591 Special Topics (1-3) Prereq: Consent of instructor.

592 Readings in Planning (1-3) Prereq: Consent of instructor. May be repeated.

593 Problems in Planning (1-3) Prereq: Consent of instructor.

---

**Plant and Soil Science**

(Graduate programs in Plant and Soil Science)

**MAJOR DEGREES**

Plant and Soil Science

M.S., Ph.D.

---

John E. Foss, Head

Professors:

- F. F. Bell (Emeritus), Ph.D. Iowa State
- D. L. Coffey, Ph.D. Purdue
- B. V. Conger, Ph.D. Washington State
- J. E. Foss, Ph.D. Minnesota
- H. A. Fribourg, Ph.D. Iowa State
- L. M. Josaphson (Emeritus), Ph.D. Wisconsin
- W. L. Parks, Ph.D. Purdue
- B. S. Pickett (Emeritus), Ph.D. Michigan State
- J. H. Reynolds, Ph.D. Wisconsin
- L. F. Seatz (Emeritus), Ph.D. North Carolina State
- L. N. Skold (Emeritus), M.S. Kansas State
- M. E. Springer (Emeritus), Ph.D. California (Berkeley)
- H. D. Swingle (Emeritus), Ph.D. Louisiana State
- E. Winters (Emeritus), Ph.D. Illinois

Associate Professors:

- F. L. Allen, Ph.D. Minnesota;
- J. T. Ammons
- Ph.D. West Virginia
- D. E. Dayton, Ph.D. North Carolina State
- R. M. Hayes, Ph.D. Illinois
- W. A. Krueger, Ph.D. Illinois
- G. M. Lessman, Ph.D. Michigan State
- R. J. Lewis, Ph.D. North Carolina State
- V. H. Reich, Ph.D. Iowa State
- C. E. Sams, Ph.D. Michigan State
- D. D. Tyler, Ph.D. Kentucky
- D. R. West, Ph.D. Nebraska
- J. D. Wilt, Ph.D. Auburn

Assistant Professors:

- J. G. Gravelle, Ph.D. Purdue
- G. N. Rhodes, Jr., Ph.D. North Carolina State

The Department of Plant and Soil Science offers graduate programs leading to the Master of Science and the Doctor of Philosophy. Concentrations for the graduate programs are offered in soil science, plant breeding and genetics, and crop physiology and ecology.

For further information, contact the department head.
THE MASTER'S PROGRAM

The program requires writing a thesis based on original research. A minimum of 30 hours of graduate credit numbered 600 or above is required for the Master's degree in program of which 6 credits must be Thesis 500. At least 14 credits must be taken in courses numbered above the 500 level. The student's advisory committee will consist of the major professor, who will act as chairperson of the committee, and a minimum of two other faculty members. The advisory committee approves the student's research problem and coursework and conducts the final oral examination covering the thesis and graduate courses.

THE DOCTORAL PROGRAM

A minimum of 72 hours beyond the Bachelor's degree, exclusive of credit for Thesis 500, is required. Of this number, 24 hours must be Doctoral Research and Dissertation 600. A minimum of 26 hours must be completed in courses numbered above 500 exclusive of doctoral research and dissertation, of which 6 must be in courses numbered above 600. A minimum of 9 hours of graduate course work taken during the doctoral program must be outside the department in one or more cognate areas. The student and the major professor identify a doctoral committee composed of at least four faculty members holding the rank of assistant professor or above, three of whom, including the chair, must be approved by the Graduate Council to direct doctoral research. At least one member must be from outside the department. The committee must approve all course work 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.

1 yr biological sciences and 1 semester chemistry. 2 hrs and 1 lab. Sp

453 Principles of Plant Breeding (3) Genetic principles and techniques used in crop improvement. Prereq: Biology 220 or equivalent. 2 hrs and 1 lab. Sp

471 Statistics for Biological Research (3) Application of statistics to interpretation of biological research. Notation, descriptive statistics, probability, 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 (1) Application of speaking, writing, and organizational skills in preparation and presentation of scientific material to both scientific and general audiences. Preparation of abstracts for scientific presentations. F,Sp

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

511 Advanced Soil Fertility (3) Concepts of soil chemistry as related to nutrient movement and adsorption by plant roots. Fertilizer use efficiency as measured by plant response factors. Prereq: 413. Sp,A

512 Pedology (3) Physical and chemical weathering processes, factors of soil formation, soil forming processes. Prereq: 412 or consent of instructor. 2 hrs and 1 lab. F,A

514 Soil Physics (3) Physical and chemical relationships among solid, liquid and gaseous phases of soil system. Dynamics, interrelationships and interaction of phases on soil density, moisture characteristics, aeration and relationship to plant growth. Prereq: 413 or consent of instructor. 2 hrs and 1 lab. F,A

530 Integrated Pest Management (3) (Same as Entomology and Plant Pathology 530.)

532 Advanced Crop Ecology (3) General and specific relations among environmental factors, crop organisms, and agricultural systems; quantification of macro- and micromammalian influences on crop growth; world climates, crop distribution and productivity, human cultures, and their interaction. Prereq: 471 or equivalent; 431 or consent of instructor. 2 hrs and 1 lab. F,A

551 Advanced Plant Genetics (3) Discovery of genetics: controlling elements, induced mutations, genome organization, sterility, inbreeding, heterozygosity, linkage, dominance, genealogical inheritance, apomixis, incompatibility systems, and genetic engineering of higher plants. Prereq: 413 or consent of instructor. F,A


571 Design and Analysis of Biological Research (3) (Same as Animal Science 571.)

583 Special Problems in Plant and Soil Science (1-3) May be repeated. Maximum 6 hrs. E

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

601 Special Topics in Soil Science (1-3) Thermodynamics of soil solutions, clay structure and surface chemistry, soil mineralogy, plant mineral nutrition, soil microbiology, water movement and use by plants, soil structure, soil thermal properties, interaction in the soil-plant environment. May be repeated. Maximum 6 hrs. E

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 6 hrs. E

613 Advanced Soil Chemistry (3) Surface and colloid chemistry of soil minerals; recent developments in ion speciation, ion movement, surface charge, surface complexation and soil colloidal stability. Prereq: 413 or consent of instructor. F,A


633 Plant Growth Control and Herbicide Action (3) Principles and techniques of plant hormone synthesis, methods of action and uses of herbicides and plant growth regulators and their effects on plant morphology, metabolic systems, and enzymatic activities. Practical aspects and current commercial uses of plant growth regulators. Prereq: Botany 521 and 522 or equivalent. F,A

653 Advanced Plant Breeding (4) Development and utilization of concepts of quantitative parameters, inbreeding, heterosis, methods of selection, in vitro breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prereq: 453 and 571 or equivalent or consent of instructor. 3 hrs and 1 lab. Sp,A

671 Advanced Research Planning (3) Development of agricultural research proposals utilizing prescribed resources and emphasizing experimental design and statistical techniques. Prereq: 571, Animal Science 572, Statistics 461, or equivalent. (Same as Animal Science 571.) F,A

Political Science (College of Liberal Arts)

MAJORS

DEGREES

Political Science, M.A., Ph.D.

Public Administration, M.P.A.

Professors:

R. S. Avery (Emeritus), Ph.D. Northwestern;

D. H. Carlisle (Emeritus), Ph.D. North Carolina;

A. H. Chance, Ph.D. Missouri;

V. R. Iredell, Ph.D. Chicago; W. Lyons, Ph.D. Oklahoma; H. Plaas, Ph.D. Utah;

N. M. Robinson (Emeritus), Ph.D. Syracuse;

T. A. Smith, Ph.D. Ohio State;

R. S. Avery (Emeritus), Ph.D. Northwestern;

Political Science/Fields of Instruction

600 Political Science/Fields of Instruction

133

605 Special Topics in Plant Breeding and Genetics (1-3) Genotype by environment interactions, estimation of quantitative parameters, mutations, chromosome dynamics, polyploidy, genetic engineering, interspecific hybridization, linkage, screening methods, genome organization. May be repeated. Maximum 6 hrs. E

613 Advanced Soil Chemistry (3) Surface and colloid chemistry of soil minerals; recent developments in ion speciation, ion movement, surface charge, surface complexation and soil colloidal stability. Prereq: 413 or consent of instructor. F,A


633 Plant Growth Control and Herbicide Action (3) Principles and techniques of plant hormone synthesis, methods of action and uses of herbicides and plant growth regulators and their effects on plant morphology, metabolic systems, and enzymatic activities. Practical aspects and current commercial uses of plant growth regulators. Prereq: Botany 521 and 522 or equivalent. F,A

653 Advanced Plant Breeding (4) Development and utilization of concepts of quantitative parameters, inbreeding, heterosis, methods of selection, in vitro breeding, interspecific hybridization, stability parameters, genetic resistance and vulnerability to pests and environmental stresses. Prereq: 453 and 571 or equivalent or consent of instructor. 3 hrs and 1 lab. Sp,A

671 Advanced Research Planning (3) Development of agricultural research proposals utilizing prescribed resources and emphasizing experimental design and statistical techniques. Prereq: 571, Animal Science 572, Statistics 461, or equivalent. (Same as Animal Science 571.) F,A
ADMISSION REQUIREMENTS
Three departmental recommendation forms must be submitted to The Graduate School, each of which must be completed by instructors at the institution most recently attended. In addition, scores on the general portion of the Graduate Record Examination must be submitted.

THE MASTER OF ARTS PROGRAM
A Bachelor’s degree or its equivalent is required for admission. Normally an overall average of 3.0 is also required together with an average of 3.2 in the last two years of political science or social science. In addition, a composite score of at least 1100 on the verbal and quantitative parts of the GRE is normally required.

Each candidate must earn 6 semester hours by writing a thesis and at least 24 additional hours by taking regular course work. A total of 30 hours is required. At least 12 of these hours must be in political science, 6 in the field of methodology (Political Science 510 and 512). Finally, an oral examination on the course work and thesis is required.

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 - 24 hours
   - General perspectives - required courses (6 hours). 550 Public Administration; 552 Organization Theory.
   - General perspectives - elective courses (3 hours). 556 Policy Analysis; 558 The Politics of Administration.
   - Analytical skills (6 hours). 512 Quantitative Political Analysis; 514 Research and Methodology in Public Administration.
   - Management skills (6 hours). 560 Public Budgeting and Finance; 562 Human Resources Management in Public Organizations.

2. Specialization - 9 hours
   - A specialization is designed by the student in consultation with the coordinator of the M.P.A. program. Possible specializations include the following, of which must be used toward degree requirements. May be repeated with consent of department. Maximum 6 hrs.
   - Political Attitudes and Opinions (3) Nature, formation, development, and dissemination of politically relevant attitudes and opinions in American political system.

3. At least 9 hours must be earned in political science courses.

4. At least 48 hours in political science courses must be in courses numbered above 500.

5. At least 9 hours must be earned in political science courses numbered above 600.

4. A total of 24 hours must be earned by writing the dissertation.

410 Special Topics in United States Government and Politics (3) May be repeated with consent of department. Maximum 6 hrs.


420 Political Attitudes and Opinions (3) Nature, formation, development, and dissemination of politically relevant attitudes and opinions in American political system.

421 Political Parties and Interest Groups (3) Examination of role of political parties and organized groups in American politics and government.

422 Political Campaigns and Elections (3) Analysis of nature of campaigns and elections in American political process.

430 United States Constitutional Law: Sources of Power and Restraint (3) Analysis of judicial review, constitutions of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political and economic rights.

431 U.S. Constitutional Law: Civil Rights and Liberties (3) Analysis of current issues in civil rights and liberties including: first amendment freedoms, equal protection, privacy and rights of accused.

440 Public Management and Human Resources (3) Mobilization and management of technical and human resources in pursuit of public sector organization goals.

441 Budgetary Process and Financial Management (3) Fiscal planning, budget and expenditure processes in government, their policy and administrative implications.

442 Administrative Law (3) Legal dimensions of administrative power and procedures, and constitutional controls over administrators.

452 Black African Politics (3) Recent evolution and current political environment of Black African nations. (Same as Afro-American Studies 452.)

454 Government and Politics of China and Japan (3) Examination of the political setting, structure and political processes in China and Japan.

455 Latin American Government and Politics II (3) Selected topics on Latin American political dynamics, consideration of leading theoretical explanations. (Same as Latin American Studies 455.)

459 Government and Politics of the Soviet Union (3) Origins and development of Soviet political system, and study of selected policy areas.

460 Revolution (3) Examination of characteristics, theories, and consequences of revolution with particular focus on left-wing revolutions and movements.

461 Policy Making in Democracies (3) Comparative approach to theory and process of making public policies.

463 Contemporary Middle East Politics (3) Governments and movements in Middle East, their characteristics, bases, and interrelationships.

464 Special Topics in Comparative Government (3) May be repeated with consent of department. Maximum 6 hrs.

469 Soviet Foreign Policy (3) Overview of Soviet international behavior since 1917 and examination of selected problems of Soviet foreign policy post World War II.

470 International Law (3) Nature and development of international law and compliance. Function of international law in context of international conflict.

475 Ancient and Medieval Political Thought (3) Survey of major western political thinkers from Socrates to Marsilio of Padua.

476 Modern Political Thought (3) Survey of major western political thinker from Machiavelli to Marx.

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

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

510 Scope and Methods in Political Science (3) Procedures of analysis in political science.

512 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: univariate and bivariate statistics.

513 Quantitative Political Analysis (3) Methods and techniques in quantitative political analysis: multivariate model building.

514 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and reporting of data.

520 Political Theory (3) Selected political thinkers, schools, historical periods. May be repeated with consent of department. Maximum 9 hrs.

530 Topics in American Government and Politics (3) Survey of literature, approaches to research and analysis, critical examination of major works, and overviews of research in various subfields. May be repeated with consent of department. Maximum 9 hrs.

531 Topics in Parties and Elections (3) Analysis of party systems and electoral behavior. May be repeated with consent of department. Maximum 9 hrs.

534 Topics in American National Institutions (3) Deals with congress, executive or related subjects. May be repeated with consent of department. Maximum 9 hrs.

536 Comparative State Politics (3) Government and political processes of fifty states: general and particular characteristics. May be repeated with consent of department. Maximum 9 hrs.

538 Urban Politics and Administration (3) American urban structures and public policies. May be repeated with consent of department. Maximum 9 hrs.
552 Organization Theory (3) Appraisal of major theories of organization and their applicability to public sector.

554 Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor. May be repeated with consent of department. Maximum 9 hrs.

556 Policy Analysis (3) Role of administrators in policy analysis and decision making. May be repeated with consent of department. Maximum 9 hrs.

588 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.

567 Comparative Public Administration (3) Comparison of policy-making structures and public policies in selected countries. May be repeated with consent of department. Maximum 9 hrs.

568 Special Topics in Public Administration (3) Analysis of selected issues and problems in public administration. May be repeated. Maximum 9 hrs.

569 Internship in Public Administration (3-9) Open to students participating in approved internship programs. May be repeated with consent of department. Maximum 9 hrs. S/NC only.

570 Comparative Government and Politics (3) Selected topics in modern governments. May be repeated with consent of department. Maximum 9 hrs.

572 The Politics of Development (3) Selected topics dealing with political problems of less developed countries. May be repeated with consent of department. Maximum 9 hrs.

574 Area Seminar in Comparative Government and Politics (3) Selected topics in area studies: African, Asian, Latin America, Middle East, Soviet Union and Eastern Europe or Western Europe. May be repeated with consent of department. Maximum 9 hrs.

580 International Politics (3) Survey of literature and major aspects of international politics. May be repeated with consent of department. Maximum 9 hrs.

582 Theory and Analysis of U.S. Foreign Policy Processes (3) Theoretical approaches to decision making in foreign policy area and analysis of policy-making process. May be repeated with consent of department. Maximum 9 hrs.

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

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

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

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

610 Research Seminar in Empirical Theory and Methodology (3) Advanced methods and procedures of analysis in political science. May be repeated with consent of department. Maximum 9 hrs.

620 Research Seminar in Political Theory (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

630 Research Seminar in the American Political Process (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

640 Research Seminar in U.S. Constitutional Law (3) Systematic analysis of published research and judicial decision: development of constitutional law as major component of public policy. May be repeated with consent of department. Maximum 9 hrs.

652 Research Seminar in Public Administration (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

670 Research Seminar in Comparative Government and Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

680 Research Seminar in International Politics (3) Research into selected topics. May be repeated with consent of department. Maximum 9 hrs.

Polymer Engineering

See Materials Science and Engineering

Psychology (College of Liberal Arts)

MAJOR

Psychology ........................................ M.A., Ph.D.

DEGREES

Raymond R. Shrader, Acting Head

Professors:


Associate Professors:


Assistant Professors:


*Part-time.

THE MASTER'S PROGRAM

Graduate study leading to the Master of Arts in general psychology is normally available only to students in the doctoral program in psychology. Requirements are (1) a score of at least 630 on the GRE in psychology; (2) at least 30 hours of graduate-level courses in psychology; and (3) a Master's thesis based on at least 6 hours of Thesis 500. A non-thesis Master's degree is available with the approval of the student's supervisory committee upon successful completion of a total of at least 36 hours in graduate-level courses in psychology and a final written examination.

THE DOCTORAL PROGRAM

A student with a B.A. or B.S. may apply to the Department of Psychology for admission to the doctoral program with a concentration in general psychology or clinical psychology. The doctoral program with a concentration in ethology or physiology is offered through the Life Sciences Program. Doctoral study in industrial and organizational psychology is offered through the Intercollegiate Program in Industrial and Organizational Psychology, to which application is made through the Department of Management.

Departmental Requirements

All students in the doctoral program in psychology must obtain a score of at least 630 on the GRE in psychology by the end of the first year, and all students must pass the departmental general psychology examination (a comprehensive, two-day essay exam offered twice each year) by the end of the second year. In addition, each student must pass the doctoral comprehensive examination, complete an acceptable doctoral dissertation, and conduct a satisfactory oral defense of the dissertation. All doctoral students must complete a minimum of 78 hours of graduate-level courses, including courses required by their program; at least 6 hours in courses outside of psychology; and at least 24 hours of dissertation research (Psychology 600).
toward careers in research and teaching in psychology in academic, institutional, or industrial settings. The program is highly flexible and individualized and seeks to provide a professional apprenticeship.

Specializations include behavioral medicine and health psychology, child and adolescent development, cognitive and symbolic processes, conditioning and learning, ethology, existential phenomenology, psychometrics, psychophysiology, social psychology, and others. Requirements of the program are as follows:

1. Statistics 537-38, or equivalent, and two additional graduate-level courses numbered above 500 in research methodology, quantitative methods, statistics, or psychometrics.
2. Competence in general psychology, demonstrated by completing Psychology 513 (Introduction to Psychology) or Psychology 420 (History and Systems of Psychology) or equivalent, plus at least one course or sequence or equivalent from each of four categories in the following list. (This requirement may be met by passing approved written examinations.)
   a. Biological psychology: 461-69 Physiological Psychology and Laboratory
   d. Developmental psychology: 511 Developmental Psychology; 512 Life-span Development; 574 Child Psychopathology.
   e. Individual differences and personality: 445 Measurement and Testing; 470 Theories of Personality.
3. Research Practicum (590) - 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 professional career as a licensed clinical psychologist capable of working in both academic and applied settings. The program emphasizes the theoretical foundations of psychology as well as supervised experience oriented toward the development of practical skills. The program uses the scientist-practitioner model of clinical psychology. Requirements are as follows:

1. Apprenticeship with one faculty member during the first year, one day each week.
2. Pre-dissertation research project completed before forming a doctoral supervisory committee, reported in written form acceptable to the student’s faculty advisor and the director of clinical training.
3. Supervised clinical placement two days (16 hours) each week during the second, third, and fourth years.
4. Satisfactory completion of listed courses (or equivalents) in the following nine categories:
   a. Foundations of Psychology (513);
   b. Measurement and Testing (445);
   c. Personality Theory and Research (570-71);
   d. Lifespan Development (512);
   e. Statistics and research methods (504 Empirical Methods in Psychology plus either 505 Research Design or 557 Applied Psychological Measurement);
   f. Psychopathology (572, 573, 574);
   g. Psychological Assessment (594-595, 599);
   h. Psychotherapy (670, 671, 673, 679);
   i. Ethical, Legal, and Professional Issues (655).
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.
7. Satisfactory completion of two days each week during the second, third, and fourth years.

469 Laboratory in Physiological Psychology (3) Laboratory studies of nervous system and physiological correlates of behavior.
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: 310 or equivalent. Recommended prereq: 210, 220, 385, 396. May be repeated. Maximum 9 hrs.
489 Supervised Research (1-9) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs in 389, 489, 491, 492, and 493 combined may apply toward undergraduate major.
500 Thesis (1-5) P/NP only. E
502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when student uses University facilities and/ or faculty 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 psychology, including designs: experiments, quasi-experiments, observational studies, surveys, and program-evaluations. Development of questions and hypotheses for study. Design of studies to maximize validity. Prereq: Consent of instructor.
508 Readings and Special Problems in Psychology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
509 Research Practicum (2) Required of first-year graduate students in psychology. May be repeated. Maximum 9 hrs.
510 Topics in Psychology (3) Intensive examination of selected problem(s) in psychology. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
511 Developmental Psychology (3) Normal processes of human socialization; physical, cognitive, and emotional development from conception through infancy, childhood, and adolescence. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
512 Life-Span Development (3) Theories and research concerning normal human development throughout life, adulthood and old age. Prereq: Consent of instructor.
513 Foundations of Psychology: Biological factors, Perception, Learning, Thinking, Motivation (4) Intensive survey. Prereq: Consent of instructor.
516 Colloquium in Ethology (1) Current research and theory. May be repeated. Maximum 9 hrs. (Same as Zoology 516.) S/NC only.
517-18 Proseminar in Industrial and Organizational Psychology (3,3) (Same as Management 567-68.)
520 Interventions for Behavioral Change (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Interventions by people in community: teachers or supervisors. Token economies and strategies for self-control. Prereq: Consent of instructor.
525 Laboratory Techniques and Instrumentation (3) Procedures for laboratory research involving 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, function, and neuroanatomy of central and peripheral nervous system. Prereq: 461, 469, or equivalent and consent of instructor. (Same as Zoology 526.)
579 Psychological Assessment II (3) Basic concepts and techniques of adult assessment: intelligence tests and personality tests. Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

596 Laboratory in Psychological Assessment (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 6 hrs.

597 Psychological Assessment of Children (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor. Coreq: 594 or 595. May be repeated. Maximum 6 hrs.

600 Doctoral Research and Dissertation (1-15) P/NC only. E.

601 Seminar in Psychology (3) 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.

616 Seminar in Behavioral Neuroscience (3) Prereq: 461, 462, and consent of instructor. May be repeated. Maximum 12 hrs.


620 Seminar in Social and Organizational Psychology (3) Prereq: 440 or 550 and consent of instructor. May be repeated. Maximum 12 hrs.

622 Seminar in Comparative and Ethological Psychology (1-5) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

623 Seminar in Methods of Naturalistic Research (3) Prereq: 546 or consent of instructor. May be repeated. Maximum 12 hrs.

624 Seminar in Psychometrics (3) Prereq: 555 or consent of instructor. May be repeated. Maximum 9 hrs.

625 Seminar in Organizational Psychology (3) (Same as Management 625.)

626 Seminar in Industrial Psychology (3) (Same as Management 626.)

627 Seminar in Applied Industrial Psychology (3) (Same as Management 627.)

635 Ethical, Legal, and Professional Issues in Psychology (3) (Same as Educational and Counseling Psychology 635.)

638 Current Topics in Industrial/Organizational Psychology (3) (Same as Management 638.)

661 Advanced Psychometrics (3) Construction and standardization of psychological tests, questionnaire rating scales; 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 15 hrs.

670 Psychodynamic Psychotherapy I (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor.

671 Psychodynamic Psychotherapy II (3) Prereq: Admission to doctoral program in clinical psychology or consent of instructor.
411 Modern Religious Philosophies (3) Religious implications of major Western thinkers and movements from Nicolas of Cusa to nineteenth-century German Idealists. (Same as Philosophy 411.)

412 Classical Indian Systems of Philosophy: The Moksha Tradition (3) Investigation of selected writings and philosophic problems of traditions of Samkhya, Yoga, Vedanta, Buddhism, or Jainism. Prereq: 374 or 376 or consent of instructor. (Same as Philosophy 412.)

418 Jesus and Paul Compared (3) Central ideas and concepts of each person compared with equivalent concepts in the other. Advanced study of Gospels.

419 Jr. and Sr. Seminar (3) Advanced seminar in meaning of major Western thinkers and movements in religious studies as a graduate concentration.

426 Seminar in the Study of the Bible (3) Same as Religion 426.

438 African Studies (3) Same as Philosophy 438.

516 A. S. Allen, Ph.D. California (Berkeley); P. E. Barrette, Ph.D. California (Berkeley); L. Williamson, Ph.D. Illinois; W. H. Helfin, Ph.D. Florida State; T. B. Irving (Emeritus), Ph.D. Princeton; F. D. Mauruso (Emeritus), Ph.D. Columbia; M. Petrovskia, Ph.D. Kentucky; C. Pinsky (Emeritus), Ph.D. California (Berkeley); J. B. Romeiser, Ph.D. Vanderbilt; A. M. Vazquez-Bigl, Ph.D. Minnesota; A. H. Wallace, Ph.D. North Carolina; (Chapel Hill); Y. M. Washburn, Ph.D. North Carolina (Chapel Hill).

499 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

490 Seminar in American Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

435 Seminar in Asian Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

440 Seminar in Comparative Religion (3) Selected figures, themes, movements, and problems. Content varies. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

446 Theoretical Issues in Medical Ethics (3) (Same as Philosophy 446.)

490 Readings and Research in Religious Studies (3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

499 Proseminar in Religious Studies (3) For advanced students in religious studies; required for majors. Selected specific topics: nature and function of myth in religion, problem of evil, transcendence, theories of religion, hermeneutics, integrating various disciplines involved in study of religion. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

531 Topics in Religion and Society (3) Prereq: Consent of instructor.

532 Topics in the History of Religions (3) Prereq: Consent of instructor.

533 Topics in Religious Thought (3) Prereq: Consent of instructor.

544 Applied Ethical Theory (3) (Same as Philosophy 544.)

566 Topics in U.S. Religious History (3) Research in methods and sources for investigating United States religious history. Prereq: 351, 353, 355, 430, or consent of instructor. May be repeated. Maximum 6 hrs. (Same as History 566.)

570 Philosophy of Religion (3) (Same as Philosophy 570.)

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

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

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

Romance Languages

(Majors of Liberal Arts)

MAJORS | DEGREES
--- | ---
French | M.A.
Spanish | M.A.
Modern Foreign Languages | Ph.D.

John B. Romeiser, Head

Professors:
P. E. Barrette, Ph.D. California (Berkeley);
C. W. Cobb, Ph.D. Tulane; J. C. Elliott, M.A.
Illinois; W. H. Helfin, Ph. D. Florida State;
T. B. Irving (Emeritus), Ph.D. Princeton;
F. D. Mauruo (Emeritus), Ph.D. Columbia;
M. Petrovskia, Ph.D. Kentucky; C. Pinsky
(Emeritus), Ph.D. California (Berkeley);
J. B. Romeiser, Ph.D. Vanderbilt;
A. M. Vazquez-Bigl, Ph.D. Minnesota;

Associate Professors:
W. F. Byess (Emeritus), Ph.D. Wisconsin;
E. J. Campion, Ph.D. Yale; R. M. DeRycke,
Ph.D. Illinois; D. M. DiPuccio, Ph.D. Kansas;
M. H. Handelman, Ph.D. Florida; K. D. Levy,
Ph.D. Kentucky.

Assistant Professors:
A. S. Allen, Ph.D. California (Berkeley);
S. DiMaria, Ph.D. Wisconsin; C. K. Duncan,
Ph.D. Illinois; F. Perez-Pineda, Ph.D.
Pennsylvania State; C. V. Rogers, Ed.D.
Georgia; B. S. West, Ph.D. North Carolina,
(Chapel Hill); L. Williamson, Ph.D. Illinois.

The Department of Romance Languages offers two advanced degrees: the Master of Arts in French and in Spanish and the Doctor of Philosophy in Modern Foreign Languages. Inquiries should be addressed to the head of the department. The head, through the coordinators of Spanish and French, will make available further departmental requirements, regulations, and materials not listed below.

THE MASTER'S PROGRAM

Thesis Option

1. Completion of a minimum of 24 semester hours in course work plus at least 6 hours in course 500 Thesis. In French, 501 is required; in Spanish, 550. A maximum of 6 hours may be taken at the 400 level, the rest at the 500 level, and under certain conditions the student may take 600-level seminars. If the student chooses to have a minor (such as Italian or Portuguese), at least 24 hours (including 6 hours of thesis) must be taken in the major, 6 in the minor.

2. A thesis, with a minimum of 6 semester hours in course 500.

3. A written examination covering the course work and selected items from a master reading list.

4. A final oral examination covering the thesis.

Non-Thesis Option

1. Completion of at least 30 semester hours, with a maximum of 9 at the 400 level, the rest at the 500 level, including 501 (French) or 550 (Spanish). Under certain conditions, the student may take 600-level seminars. If the student chooses to have a minor (such as Italian or Portuguese), at least 24 hours must be taken in the major, 6 in the minor.

2. Three term papers that have been accepted by the student's advisory committee.

3. A written examination covering the course work and selected items from a master reading list.

4. A final oral examination to discuss the papers (French M.A. only).

THE DOCTORAL PROGRAM

The Ph.D. in Modern Foreign Languages is offered jointly by the Department of Germanic and Slavic Languages and the Department of Romance Languages and requires advanced training in at least two foreign languages.

Admission Requirements

Applicants must have completed a B.A. in either French, German or Spanish to be accepted into this program. Both graduates of institutions in the United States and those with undergraduate degrees from institutions outside the United States must have a grade point average of at least 3.0. Consideration will also be given to applicants who do not have an undergraduate degree in one of the three foreign languages but do have the equivalent of an undergraduate major in one of them. Applicants should present scores that are no lower than the 40th percentile on the Graduate Record Examination (GRE) subject test in the foreign language of their first concentration.

Requirements for the Ph.D.

Candidiates must complete a minimum of 60 semester hours of course work beyond the Bachelor's degree in addition to 24 hours of doctoral research and dissertation. The program shall consist of a first concentration, a second concentration, and a cognate field.

1. First Concentration: French, German or Spanish. It will consist of a minimum of 39 semester hours beyond the Bachelor's degree, distributed as follows:

   Minimum of 21 hours at the 500 level (exclusive of thesis hours) including French 584 (3), German 560 (3), or Spanish 550 (3); German 521-22 (1,1), French 512 (2), or Spanish 512 (2); French 515-16 (2,2), or German 520 (3).

2. Second Concentration: French, German, Italian, or Spanish (different from the first concentration). It shall consist of at least 18 hours of courses beyond the Bachelor's degree, at least 12 of which must be at the 500 or 600 level.

3. Cognate Field: Six hours must be in courses numbered 400 and above in a field outside the department of the first concentration but related to the student's principal area of research. If the cognate field is yet a third foreign language, a reading proficiency exam will be administered after completion.
of the 6 cognate hours by the language section concerned.

4. Additional Requirements: A student must demonstrate competence in languages of both his/her first and second concentrations by taking a test in each language. The test will include reading, writing, listening and speaking, and should be completed by the time the student reaches 40 hours of study beyond the Bachelor's degree. Standardized examinations that may be used for this purpose include applicable portions of either the National Teachers Examination, the MLA Examination for Teachers and Advanced Students, or the proficiency standards of the United States Foreign Service Institute (FSI). If the student has not chosen a third language as his or her cognate area, basic competence (determined by a reading examination of translation into English administered by the department concerned) in a third language is required. If the student's first and second languages are Romance languages, the third language should be chosen from another language branch.

A comprehensive examination on the language and literature of the first and second concentrations must be passed before the student may be admitted to candidacy. The candidate will be required to defend his/her dissertation in an oral examination. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

Graduate Teaching Assistants in the program should have the opportunity and will be strongly encouraged to instruct in at least two foreign languages, subject to staffing needs.

Doctoral students will be strongly encouraged to reside and study abroad and will be assisted in identifying potential sources of financial support (e.g. Fulbright, McCrure, Rotary fellowships).

For additional courses, refer to Germanic and Slavic Languages.

French


411 French Literature of the 16th Century (3) Highights of 16th-century French literature. Excerpts from Rabelais, Montaigne, readings of poems from writers of the first half of 16th century, Rabelais and other prose writers, humanists, and poetry of Marot, Lyonais genre, hagiography, epic, romance, lyric poetry, drama.

412 French Literature of the 17th Century (3) Major works of Enlightenment. Prereq: 212, 218 or equivalent.

413 French Literature of the 18th Century (3) Major works of Romanticism and its counter movements: Realism, Naturalism, and Naturalism. Prereq: 212, 218 or equivalent.


416 Survey of Francophone Literature (3) Writing in French outside of France. Prereq: 212, 218 or equivalent.

420 French Cinema (3) French cinema from earliest days through New Wave. 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 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 phonology, 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 grammar. Prereq: 6 hrs of upper-division French or 6 hrs of upper-division courses in a modern or an ancient language (exclusive of German and French 301-62, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as German 425, Russian 425, Spanish 425, and Linguistics 425.)

426 Methods of Historical Linguistics (3) (Same as German 426, Russian 426, Spanish 426 and Linguistics 426.)

429 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 429 and Linguistics 429.)

430 Theatrical French (2-3) Performance in one or more French plays. Prereq: 212, 218 or equivalent and consent of instructor. May apply toward major.

431 Highlights of French Civilization (3) Survey of French civilization from the Gauls to World War II. Historical events, daily life, all forms of arts. Prereq: 212, 218 or equivalent.

432 Contemporary French Culture (3) French contemporary civilization and culture since World War II. Problems, trends, and organization of French society today. Prereq: 212, 218 or equivalent.

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

501 Techniques in Literary Analysis (2) Required for M.A. program. Intensive course in exposition de texte, a close stylistic analysis of texts representative of different eras and of different genres.

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

512 Teaching a Foreign Language (2) 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 and experience warrants their being excused by department.

515-16 Bibliography and Methods of Research (2,2) Survey of critical research tools and scholarly contributions in French literature and language. Practical exercises on compiling of scholarly notes.


531 French Literature of the 16th Century I (3) Literature of first half of 16th century. Rabelais and other prose writers, humanists, and poetry of Marot, Lyonais genre, hagiography, epic, romance, lyric poetry, drama.

532 French Literature of the 16th Century II (3) Literature of second half of 16th century. mature works of Yoda writers and such poets as d'Aubigne and Sponde; Montaigne, writers of scientific works and memorialistic drama.

541 French Literature of the 17th Century I (3) French poems and prose works of 17th century.

542 French Literature of the 17th Century II (3) Classical French theatre of 17th century.

551-52 French Literature of the 18th Century: the Philosophes (3,3) Textual analysis of works of Voltaire, Diderot, Rousseau, and other major French 18th-century writers.

559 Problems in Linguistics: Romance Languages (3) Maximum 6 hrs with consent of department. (Same as Spanish 559 and Linguistics 559.)

561-62 Lyric Poetry of the 19th Century (3,3) Reading and interpreting great French romantic poets, Tart pour l'art movement, Parnassians, Charles Baudelaire and Musset.

571-72 Trends in Modern French Literature (3,3) In-depth study of some of most revolutionary, challenging poets, novelists, dramatists of 20th century.

581-82 The French Novel (3,3) French Novel from 17th through 20th centuries.

583 Problems in Stylistics (3) Survey of comparative English-French stylistics. Development and improvement of one's written French.

584 Literary Criticism: The Foundations of Romance Criticism (3) Survey of critical ideas utilized over centuries and applied to various types of literature.

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

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

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

594-95 French Directed Readings (3,3)

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

Italian

401 Dante and Medieval Culture (3) Introduction to significance of this great Italian writer. Prereq: 212 or consent of instructor.

402 Petrarch and Boccaccio (3) Prereq: 212 or consent of instructor.

403-04 Literature of the Rinascimento (3,3) From Pico to Tasso, Quattrocento and Cinquecento. Prereq: 212 or consent of instructor.

405 Modern Italian Poetry (3) From Pascoli to Montale. Prereq: Italian 212 or consent of instructor.

406 The Modern Italian Novel (3) From Manzoni to Calvino. Prereq: 212 or consent of instructor.

409 Directed Readings (3)

510-11 Readings in Italian Literature (3,3) Topics vary. May be repeated with consent of department.

512-13 Special Topics (3,3) Topics vary. May be repeated with consent of department.

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

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

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

Portuguese

431-32 Directed Readings in Brazilian and Portuguese Literature (3,3) May be repeated with consent of instructor.
Spanish

421 Phonetics (2) Prereq: 212, or 218 or equivalent.
422 Advanced Grammar (3) Finer points of grammatical structures. Required of all majors. Native speakers must receive consent of instructor. Prereq: 212, 218 or equivalent.
424 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 German 426, French 426, Russian 426, and Linguistics 426.)
427 Romance Linguistics (3) (Same as French 428 and Linguistics 428.)

431 Spanish Civilization (3) Major social, political, and cultural achievements of Spanish people from origins of their civilization until today. Prereq: 311, 312 or equivalent.
432 Cervantes (3) Selections from Don Quixote and study of shorter Novelas ejemplares. Prereq: 311, 312, or equivalent.
433 Masterpieces of Spanish Literature (3) Selections from both Golden Age and modern period of outstanding works of all genres. Prereq: 311, 312 or equivalent.
435·36 Survey of Spanish Literature (3, 3) 435—Spanish literature through Golden Age. 436—Spanish literature since 1700. Prereq: 311, 312.
450 20th-Century Hispanic Theatre (3) Major 20th-century Spanish American dramatists. Prereq: 311, 312, or equivalent.
459 Capstone Colloquium in Spanish (3) Integrative experience. Broad range of issues and topics that affect much of Spanish-speaking world and also involve those who specialize in Hispanic studies. Prereq: 311, 312 or equivalent.
460 Capstone Tutorial in Spanish (1) Independent study project supervised closely by faculty member. Prereq: 311, 312, 459 or equivalent.
471 Latin American Civilization (3) Latin America’s diverse history, major social and political institutions. Prereq: 311, 312 or equivalent.
472 Masterpieces of Spanish American Literature (3) Close reading of selected works by major Spanish American writers, Darío, Paz, Borges, Pueyo, others. Genres and periods vary. Prereq: 311, 312 or equivalent.
473-74 Survey of Spanish American Literature (3, 3) 473—Historical survey from Conquest to late 19th century. 474—Major literary movements, writers and works of 20th century. Prereq: 311, 312 or equivalent.
479 Social Protest Literature of Latin American (3) Analysis of literature as means of unmasking social ills that have traditionally beset Latin America. Indigenismo, Black literature, woman 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 (2) 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 through 13th century.
532 Medieval Spanish Literature (3) Spanish literature of 14th and 15th centuries.
533 The Picarose Novel (3) Lazarillo de Tormes, Guzmán de Alfarache, and Buscón.
534 Don Quixote (3)
535 Golden Age Poetry (3) Garcilaso, Fray Luis de León, San Juan de la Cruz, Lope de Vega, Quevedo, and Góngora.
541 Galíos and the 19th-Century Spanish Novel (3) Analysis of works by Galíos and other major 19th-century novelists, Pardo Bazán, Valera, Clarín, and Pereda.
543 The 20th-Century Spanish Novel (3) Baroja, Azorín, Valle-Inclán, Pérez de Ayala, Cela, Delibes, Goytisolo, Matute, and at least one present-day novelist.
545 Modern Spanish Poetry (3) From Bécquer, Unamuno, A. Machado, Jiménez, Lorca, Guillén, Alexandre, and a contemporary, Celaya.
547 Modern Spanish Drama (3) Major playwrights of 20th-century Spain.
550 Techniques of Literary Analysis and Research Methods (3) Theoretical and critical essays on various techniques of literary analysis. Exploration of bibliographical and research materials.
551 Special Topics in Spanish or Spanish American Literature (3) May be repeated. Maximum 6 hrs.
552 Directed Readings (3)
559 Problems in Linguistics: Romance Languages (3) (Same as French 559 and Linguistics 559.)
573 The Spanish American Novel: Chile and the River Plate Nations (3) Novels from Chile, Argentina, Uruguay and Paraguay. Modern world.
576 Contemporary Spanish American Poetry (3) Major poets in Spanish American from post-modernismo to present day.
577 Spanish American Drama (3) Major playwrights of 20th-century Spanish America.

579 The Spanish American Short Story (3) Short story by major writers in Spanish America from Romanticism to present day, theory and criticism of genre.
591 Foreign Study (1-15) See page 31.
592 Off-Campus Study (1-15) See page 31.
593 Independent Study (1-15) See page 31.
600 Doctoral Research and Dissertation (3-15) P/NP only. E.
621-32 Seminar in Spanish Literature (3,3) Topics vary in field of Peninsular literature. May be repeated with consent of department. Maximum 9 hrs.
631-32 Seminar in Spanish American Literature (3,3) Topics vary. May be repeated with consent of department. Maximum 9 hrs.

Rural Practice

(Description of Veterinary Medicine)

MAJOR

DEGREE

VETERINARY MEDICINE

D.V.M.

M. H. Shires, HEAD

Professors:


Associate Professors:


Assistant Professors:


Residents:


Intern:

E. P. Mattson, D.V.M. Minnesota.

See Veterinary Medicine for Program Description.

PROFESSIONAL COURSES

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, patient 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, patient 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, patient care and treatment of clinical patients.
C. S. Wilks, Ph.D. St. Louis; P. G. Zarbock, State; A. R. Wachter, M.S.W. Tennessee; Brandeis; H. H. Vaughn, Ed.D. Memphis; A. E. Moses, D.S.W. California (Berkeley); Ph.D. Washington (St. Louis); B. P. Granger, (Emeritus), Ed.D. Columbia; C. A. Glisson, Ph.D. Washington (St. Louis); B. P. Granger, Ph.D. Brandeis; H. Hirayama, D.S.W. Pennsylvania; G. McLarnan (Emeritus), D.S.W. Tennessee; M. K. Mullins, Ph.D. Chicago; R. M. Noce, D.S.W. Tulane; B. Orchard (Emeritus), M.S. Western Reserve; J. D. Orten, D.S.W. Alabama; H. Rubenstein, Ph.D. Chicago.

Russian

See Germanic and Slavic Languages

Social Work

(College of Social Work)

MAJOR DEGREES

Social Work.......................... M.S.S.W., Ph.D.

Ben P. Granger, Head

Professors:

L. M. Beasley, Ph.D. Denver; M. H. Bloch, M.S. Ohio State; R. C. Bonovich, D.S.W. Washington (St. Louis); G. W. Fryer (Emeritus), Ed.D. Columbia; C. A. Glisson, Ph.D. Washington (St. Louis); B. P. Granger, Ph.D. Brandeis; H. Hirayama, D.S.W. Pennsylvania; G. McLarnan (Emeritus), M.S.S.W. Tennessee; M. K. Mullins, Ph.D. Chicago; R. M. Noce, D.S.W. Tulane; B. Orchard (Emeritus), M.S. Western Reserve; J. D. Orten, D.S.W. Alabama; H. Rubenstein, Ph.D. Chicago.

Associate Professors:

R. S. Avery, Ph.D. Brandeis; W. J. Bell, D.S.W. Tulane; M. Cetingok, Ph.D. Washington (St. Louis); C. T. Cruthirds, M.S.W. Tulane; C. Faver, Ph.D. Michigan; A. E. Moses, D.S.W. California (Berkeley); R. B. Rowen, Ph.D. Arizona; N. P. Tate, Ph.D. Brandeis; H. H. Vaughan, Ed.D. Memphis State; A. R. Wachter, M.S.S.W. Tennessee; C. S. Wilks, Ph.D. St. Louis; P. G. Zarbock, M.S.S.W. Wisconsin.

Assistant Professors:

P. M. Campbell, D.S.W. Alabama; J. W. Charping, Ph.D. Peabody; J. C. Collier, M.S.W. Tulane; I. C. Faust, M.S.S.W. Tennessee; A. R. Ford, M.S.W. Atlanta; V. A. Gates, M.S.S.W. Tennessee; J. Jennings, Ph.D. Michigan; D. C. Johnston, M.S.W. California (Berkeley); N. Lunn, M.S.S.W. Tennessee; M. P. Strong, M.S.W. Tulane.

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 practice 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 professional curriculum is based on the following requirements:

1. A Bachelor's degree from an accredited college or university with some 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 may request consultation regarding ways in which they might be admitted.

2. A grade point average of 2.5 on a 4.0 scale, with those falling below this average considered for provisional admission on the basis of supplemental evidence of ability to perform at a satisfactory level.

3. Personal qualifications acceptable for entrance into the professional practice of social work.

Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed no later than March 1 for the year in which admission is desired.

Advanced Standing

The University of Tennessee College of Social Work has an advanced standing program. Admission to advanced standing requires:

1. A grade point average of 3.0 or above (on a 4.0 scale) in undergraduate work.

2. An undergraduate major in social work from a program accredited by the Council on Social Work Education.

3. Passing a qualifying examination administered by the College of Social Work faculty.

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. Course work can be completed over a three- or four-year period. One year of the student's period of study must be on a full-time basis.

General Requirements

1. A minimum of 54 semester credit hours including a) the administration of foundation courses and field practice (15 hours), b) the course Social Work with Oppressed Populations (2 hours), and c) at least five courses (15 hours) and three semesters of field (16 hours) in the social work treatment concentration or at least four courses (12 hours) and three semesters of field (16 hours) in the social welfare administration and planning concentration.

2. Students may select a thesis or non-thesis option. Those students pursuing the thesis option receive 6 credit hours for successful completion of a thesis.

3. Successful completion of a comprehensive exam or thesis defense.

4. An overall GPA of 3.0 or better on all graded courses and satisfactory performance in field.

The Professional Curriculum

The professional 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 specialization provides knowledge of the theory and methodology basic to varied individual, family, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning: The social welfare administration and planning concentration provides the educational basis for leadership in the design and 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 developing 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 program. Through cooperation with a wide range of social agencies and human service programs throughout Tennessee and areas adjacent to the state, 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 possible experiences related to the foundation curriculum content and beginning concentration. Within the placement, each student's experiences are planned and designed according to educational objectives.
Second-year placements are selected according to the student's area of concentration, individual career interests, and educational needs. The student actively participates with the field practice coordinator and the concentration 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 field 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

Course work 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 course work must be approved as equivalent to required and/or elective courses taken for graduate credit and passed with a grade of B or better. S/NC credit earned for the field practice is also accepted. In addition, transfer course work must be part of an otherwise satisfactory graduate program (B average) and be approved by the dean. This course work 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 Examinations

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 for describing the procedure for applying for examination.

THE DOCTORAL PROGRAM

The College of Social Work offers the Doctor of Philosophy with a major in Social Work.

The focus of social work education at the doctoral level is to foster the development of an attitude of scientific method, to improve and extend the knowledge base of social work practice, and to reflect this attitude and competence in leadership roles in social work education, research, and practice.

The emphasis of the doctoral program is upon:

—Analysis and evaluation of the interrelationships between direct intervention and administration; and between each of them and their social policy, programmatic, organizational, and community context.

—Development, within this interrelational framework, of research-based knowledge to inform and guide social work practice, social policy, planning, and social welfare program development.

The program consists of foundation courses, advanced seminars, and dissertation research. The foundation courses are available only in Knoxville and are scheduled over an academic year. Students and their committees can develop a plan for completing a portion of research in Nashville and Memphis based on availability of course offerings and 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 three years of post-Master's social work/social welfare experience. Applicants who do not meet these requirements will need to achieve equivalent credentials as specified by the Doctoral Admission Committee before initial registration.

General Requirements

1. A minimum of 60 semester hours beyond the MSSW including a) completion of 21 credits of required coursework, b) completion of 15 credits of advanced electives, at least 12 of which are taken outside the department, and c) completion of at least 24 credits of dissertation research.

2. Successful completion of comprehensive and final examinations.

3. Completion and defense of the dissertation.

Curriculum

The curriculum of the Ph.D. program consists of foundation course work, electives, and dissertation research. The foundation curriculum consists of 21 hours of course work 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 course work in Social Work and other departments of the University.

Typically, the foundation curriculum is completed and elective course work 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 foundation curriculum is completed on a full-time basis, subsequent course work and dissertation research can be completed on a planned part-time basis.

Specific courses required are 501, 502, 510, 516, 520, 522, or consent of instructor. Sp

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. Prerequisite: 510 and consent of faculty conducting investigation. May be repeated. Maximum 6 hrs. S/NC only. E

509 Graduate Seminar in Public Health (1) Same as Public Health 509, Nursing 509, Nutrition and Food Science 509, Physical Education 509.

510 Social Work Research (3) Research methodology applied to problems in social welfare. Problem formulation; research design; ethics; instrument construction; data collection; research design; statistical procedures; research reporting; and utilization and research of research. Prerequisite: Admission to college or consent of instructor. F

512 Social Work Practice (3) Basic theory, values, and methodology general to social work practice at various system levels presented from ecological perspective. Assessment, planning, communication, and evaluation skills. Classroom and skills laboratory experience. Prerequisite: Admission to college or consent of instructor. F

514 Human Behavior and Social Environment (3) Theories pertaining to individual, family, small group, and community in context of functions, structure, roles, and processes. Systems conceptualized along functional-dysfunctional and normal-deviant continua: stress, development and maturation. Open systems approach. Understanding conceptualization, biocultural, psychological, and social variables, implications of culture, race, ethnicity, and gender. Prerequisite: Admission to college or consent of instructor. F

516 Social Welfare Policy and Services (3) Development of contemporary social policy at local, state, national, and international levels. Contribution of social work professionals to formal policy-making process through which macro-societal change is effected and through which aggregate social welfare services are proposed, authorized, financed, and programmed. Theories of complex organizations applied to social welfare service delivery settings. Prerequisite: Admission to college or consent of instructor. F

518 Social Work with Oppressed Populations (3) Social work's professional role in working with individuals and groups in American society whose oppression is based upon distinguishing characteristics: age, sex, economic class, religion, sexual preference, handicapping conditions, ethnicity and race. Prerequisite: Admission to college or consent of instructor. Sp

520 Social Work Treatment with Individuals and Families (3) Nature and process of practice with individuals and families in helping them resolve or cope with problems of living. Working with disadvantaged clients and enhancing client competence. Prerequisite: Foundation or consent of instructor. S

521 Social Work Treatment with Groups (3) Theories and practice of social work with small groups. Treatment groups, task groups. Prerequisite: Foundation or consent of instructor. F

523 Social Work with Families (3) Theory and practice of social work with families. Prerequisite: Foundation or consent of instructor. F

524 Psychopathology and Social Deviance (3) Theories of and recent research on social, psychological, and criminal deviance and social variance. Categorical approach to psychopathology. Prerequisite: Foundation or consent of instruction. F

526 Research for Assessment of Social Work Treatment (3) Application of research methods for assessment of social work treatment. Prerequisites: Foundation, 520 or 522, or consent of instructor. Sp

531 Family Therapy in Social Work Practice (3) Major family therapy models, perspectives on family dynamics and interaction, and techniques of treatment and their application to families from diverse social and cultural backgrounds. Prereq: Foundation and 520, or consent of instructor.

532 Short-Term Treatment (3) Theory and practice of planned short-term treatment, emergency treatment, and hospitalization. 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 modalities for assessing and treating children and adolescents. Prereq: 520 and 522, or consent of instructor.

540 Administration of Social Welfare Programs and Services (3) Analysis of organizations and provision of services to clients. Models of social welfare administrative, theoretical, and philosophical approaches in the context of social and political systems. Prereq: 521 and 522, or consent of instructor. May be repeated. Maximum 6 hrs.


546 Human Resources Development in Social Welfare Administration (3) Administrative decision-making related to social services allocation. Techniques of fund raising and resource allocation in human service organizations. Prereq: Foundation and 520, or consent of instructor. May be repeated. Maximum 6 hrs.

550 Seminar in Social Welfare Administration and Planning (2-3) Areas and issues relating to methods and techniques of social welfare administration and planning. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

551 Seminar in Social Welfare (2-3) Social welfare problem area or field of practice. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

552 Community Organization (3) Locality development, social planning, and social action as practice models for development of resources to meet human needs. Prereq: Foundation or consent of instructor.

553 Social Planning (3) Theory, philosophy, implications for programs for planning social change in diverse fields of service. Prereq: Foundation or consent of instructor.

554 Social Policy Analysis (3) Techniques for assessing and evaluating policies and programs as components of social policy proposals. Prereq: Foundation or consent of instructor.

560 Seminar in Human Behavior and Social Environment (2-3) Areas of current importance in understanding human behavior and social environment. Specific topics, research and/or issues. Prereq: Foundation or consent of instructor. May be repeated. Maximum 6 hrs.

561 Supervision and Consultation in Social Work (3) Roles, techniques, and practices of social work supervision and consultation. Prereq: Foundation or consent of instructor.

562 Social Work and Black Families (3) Historical and contemporary theories about black family systems. Development of frameworks to assess and plan for black families within the social welfare delivery system. Prereq: Foundation or consent of instructor.

563 Social Aspects of Illness (3) Social, economic, and emotional problems arising from illness and disability and their implications for social work. Prereq: Foundation or consent of instructor.

564 Substance Abuse (3) Survey and analysis of social, cultural, medical and psychological factors underlying alcoholism and drug abuse and addiction; recent research and treatment innovations. Prereq: Foundation or consent of instructor.

565 Roles and Status of Women (3) Causes and consequences of women's social and economic roles and statuses in American society. Variations in women's experiences by race and ethnicity, class, age, and lifecycle. Prereq: Foundation or consent of instructor.

566 Social Gerontology (3) Physical, psychological and social aspects of aging. Major social policies and programs. Prereq: Foundation or consent of instructor.

570 Advanced Standing (12) Twelve-week program providing qualified students with intensive academic and field experience to complete one year of graduate study upon successful completion of term. S/NC only. Su

580 Field Practice (3) Instruction and supervision in social work practice. Prereq. or coreq: 512. S/NC only. E

581 Field Practice (4) Instruction and supervision in social work practice, student's selected concentration in social work treatment or social work administration and planning. Prereq: Foundation. S/ NC only. So

582 Field Practice (6) Instruction and supervision in social work treatment or social work administration and planning. Prereq: Foundation. 581. Prereq or coreq: Treatment: 520, 524. S/NC only. F

583 Field Practice (6) Instruction and supervision in social work treatment or social welfare administration and planning. Prereq: Foundation. 582. S/NC only. Sp

584 Field Practice (2-6) Instruction and supervision in social work practice. Prereq. or coreq: 512. May be repeated. S/NC only. E

593 Independent Study (1-4) Individualized study, student selected under faculty supervision, of special issue or problem. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. F,Sp

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

601 Research for Social Work Practice I (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice. F

602 Research for Social Work Practice II (3) Epistemological and methodological considerations for both quantitative and qualitative research for social work practice. F

604 Research in Social Service Settings (3) Advanced research, under faculty supervision, of practice issues in community agency. Prereq: First year required Ph.D. courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

608 Evaluative Research for Social Work Practice, Programs and Policy (3) Techniques and strategies for quantitative and qualitative analysis for policy's impact on individuals and groups and for evaluating processes and outcomes of social work practice. F


613 Social Work Practice and Its Social Context II (3) Critical analysis of knowledge bases of major practice modalities in administration and planning. Sp

640 History of American Social Work (3) Social, cultural, economic and political contexts for development of social work profession, development of education for profession, and modern welfare system. F

660 Issues in Social Work Knowledge Building (3) Advanced seminar in theory and model building in direct intervention, administration and planning. Prereq: First year required Ph.D. courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

693 Directed Study in Social Work Research (3) Advanced individual study, under faculty guidance, of social work practice issues. Prereq. First year required Ph.D. courses or consent of instructor. May be repeated. Maximum 9 hrs. F,Sp

Sociology (College of Liberal Arts)

MAJOR

DEGREES

Sociology

Thomas C. Hood, Head

Professors:

D. M. Betz, Ph.D. Michigan State; J. A. Black, Ph.D. Iowa; D. J. Champion, Ph.D. Purdue; D. Hastings, Ph.D. Massachusetts; T. C. Hood, Ph.D. Duke; D. R. Ploch, Ph.D. North Carolina; N. Shover, Ph.D. Illinois; S. Wallace, Ph.D. Minnesota.

Associate Professors:


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, 561, 562, 563, 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 total of 30 hours, including 24 hours of course work and 6 hours of Thesis 500, is
required. Students are strongly encouraged to complete 3-6 hours of theory (521, 622), 6 hours in methodology (531, 534), and 6 hours in statistics (535-36). Two-thirds of all credits must be completed at or above the 500 level. Sociology courses at the 400 level must be approved by the student’s advisor. An oral final examination is given at the end of the semester in which the candidate is planning to pursue a Ph.D. program are strongly encouraged to take the thesis option.

Non-Thesis Option

A total of 30 hours of course work is required. Students are encouraged to complete 3 hours of theory (521), 6 hours of methodology (531, 534), and 6 hours of statistics (535-36). Non-thesis students may select one of two plans: Plan 1 (concentration and secondary area) or Plan 2 (special studies).

Plan 1: A final written examination in one of the department’s concentrations is required for the M.A. program. Students may construct an individualized course of studies, subject to the approval of the student’s advisor and the Graduate Program Committee. Up to 12 hours may be taken in coursework outside the department, subject to approval by the student’s advisory committee. Plan 2: The student must complete a special course of studies, subject to the approval of the student’s committee and the Graduate Program Committee. A final written examination in the area of specialization is required. Subject to approval by the student’s committee, up to 12 hours may be taken in courses outside the department for either program.

THE DOCTORAL PROGRAM

Course Work

 Forty-eight hours of course work beyond the baccalaureate degree are required (exclusive of S/NC credits). Students who enter the program without the courses recommended for the M.A. program (521, 531, 534, 535-36) or equivalents are required to take remedial work beyond the minimum course requirements. Completion of 622 is recommended. Completion of nine hours in each of two concentrations is encouraged. A student who cannot achieve his/her educational goals within the department’s concentrations may construct an individualized course of study subject to the approval of the student’s doctoral committee and the Graduate Program Committee. Twelve hours of course credit in sociology at the 600 level is required. Sociology courses at the 400 level may not be taken without the consent of the student’s advisor and the Graduate Program Committee. Six hours may be taken in related fields without petitioning the Graduate Program Committee for approval. The student’s program may include a minor or cognate field.

Comprehensive Examinations

Written examinations in four areas are required (theory, 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, specializations within concentration, or other areas of specialization. Detailed information on examinations may be obtained from the department.

Dissertation and Final Examination

A dissertation based on original research must be completed (24 hours). The candidate must pass the defense of the dissertation, including the theory and methodology related to the research, in accordance with the deadlines specified by The Graduate School.

405 Sociology of Sport (3) Social meaning, organization, and process of sport. Prereq: 291 or consent of instructor. (Same as Physical Education 405.)

413 Formal Organization (3) Analysis of organizational models, typologies, and theories; hierarchies of authority; communication; interpersonal relations in work settings; organizational change.

414 Organization of Medical Care (3) Organization of health care facilities, staff-patient relationships, demographic characteristics, and prevalence of disease.

415 Sociology of Aging (3) How roles and statuses change with age in relation to major social institutions; impact that rapidly increasing number of older people has on society, effect of society on older people.

446 The Modern World System (3) Critical examination of capitalist world-system as social system, its coherence, boundaries, regions, member groups, cleavages, and patterns of conflict. Analysis of who gets what, why, and how in global political economy.


455 Society and Law (3) How laws and legal processes are affected by social change, social impact of legal sanctions, relations between law and social justice.

459 Organizational and Corporate Crime (3) Analysis and discussion of crime and deviance committed by organizations. Case studies of corporate and organizational crime, organizational dynamics of crime, theories of corporate crime, and organized responses to this type of crime by governmental regulatory agencies.

462 Populations (3) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

464 Urban Ecology (3) Relation of humans to their urban environment: conservation and use of appropriate technology. (Same as Urban Studies 464.)

471 Sociolinguistics (3) (Same as English 471 and Linguistics 471.)

480 Diffusion of Agricultural Technology (3) (Same as Rural Sociology 480.)

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

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

504 Sociological Foundations of Political Economy (3) Survey of contemporary sociological theories of political economy, sources of political and economic power and conflict.

505 Foundations of Criminology (3) Critical overview of contemporary developments in crimeology, 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 to instructional to evaluation techniques. May be repeated. Maximum 6 hrs.

521 Sociological Theory I (3) Assessment of what sociological theory is; its major figures and their approaches to understanding society.

531 Research Methods in Sociology (3) Research design, measurement, sampling, quantitative and qualitative data collection techniques, data, reduction, and analysis.

534 Advanced Sociological Analysis (3) Underlying assumptions and logical procedures used by sociologists in formulating explanations; foundations of sociological research strategies and techniques.

535-36 Statistical Analysis I and II in Sociology (3,3) Should be taken in sequence. 535—Data reduction, exploratory data analysis, general linear model. 536— Sampling, inferential statistics, based on general linear model, introduction to multi-variate analysis. Prereq: Statistics 201 or consent of instructor.

540 Occupations (3) Occupations in relation to individuals and society, technology, economic stratification, and social organizations.

541 Collective Behavior, Social Movements, Social Change (3) Basic theory and research on conditions of social unrest in human collectivities and efforts of collectives to change existing society.

542 Sociological Aspects of Sports and Physical Education (3) (Same as Physical Education 542.)

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 for demographic variables, life table analysis, increment-decrement models, and survey techniques of population analysis.

580 Advanced Rural Sociology (3) (Same as Rural Sociology 580.)

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

592 Off-Campus Study (1-15) Seepage 31.

593 Independent Study (1-15) Seepage 31.

594 Social Theories of Sport (3) (Same as Physical Education 515.)

595 Special Topics in Rural Sociology (1-3) (Same as Rural Sociology 593.)

598 Readings (3) Selected topics. May be repeated. Maximum 6 hrs.

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

611 Complex Organization (3) Selected topics in formal organizations; cases and incident process analysis; examines strategies for dealing with organizational change, authority hierarchies, communication patterns; technology and organizational structure; job satisfaction, motivation, morale and interpersonal phenomena.

622 Sociological Theory II (3) Distinct schools of sociological theory and contributions of their principal exponents. Prereq: 521 or consent of instructor.

629 Supplementary Readings in Sociological Theory (3) Individual guidance. Preparation for comprehensive examination. Prereq: Consent of instructor. S/NC only.

630 Survey Design and Analysis (3) Systematic exploration of survey problems through student participation in design and analysis of survey. Prereq: 531 or consent of instructor.
630 Field Research (3) Research experience in selected field sites using techniques of interviewing, participan-
t observation, and other methods of field research. Prereq: 531 or consent of instructor.

639 Supplementary Readings in Methodology (3) Indi-
gual 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 the-
ories of state and political processes.

645 Advanced Studies in Political Economy (3) Topical

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. Rec-
ommended prereq: 505. May be repeated. Maximum 6 hrs.

561 Theory and Methods of Human Ecology (3) His-
torical and contemporary studies of interaction between
humans and their environment. Prereq: Consent of instructor.

662 Urban and Regional Sociology (3) Historical and
contemporary studies of South and Appalachian region with comparisons to other regions.

663 Advanced Studies in Population (3) Current the-
teoretical issues and methodological advances in fertility,
mortality, and migration in modern or historical demog-
raphy. Prereq: 563 or consent of instructor. May be repeated. Maximum 6 hrs.

665 Advanced Studies in Energy, Environment and
Natural Resources Policy (3) Topical seminar covering
particular issues of energy and the environment within area.
Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

675 Advanced Studies in Social Psychology (3) Selected
current research issues related to social psychol-
ycal theories. Prereq: 541 or consent of instructor. May be repeated. Maximum 6 hrs.

680 Advanced Special Topics (3) Topic of special
interest or student-initiated courses that will not be
regularly offered. Prereq: Consent of department. May be repeated. Maximum 6 hrs.

699 Tutorials in Advanced Topics (3) Individual instruc-
tion. Prereq: Consent of department. May be repeated. Maximum 6 hrs.

Spanish

See Romance Languages

Special Programs

(College of Liberal Arts)

Lynn Champion, Director

The following courses are restricted to
participants in the James R. Stokley Fellows Program in the College of Liberal Arts. Selection of participants is based on aca-
demic ability, references, an application essay, and a personal interview. Secondary school teachers, administrators, guidance counselors, and librarians may apply. For additional information, contact the program director.

510 Perspectives in the Liberal Arts (2) Seminar on nature and development of liberal arts through study

of formative tests and critical figures, Bible, Plato,
Descartes, Milton, Darwin, Freud, Marx.

520 Inquiry in the Liberal Arts (2) Seminar on nature of creative inquiry in liberal arts and sciences; an
overview of pivotal issues within and between disci-
plines pertinent to identifying and solving problems
related to personal and social progress.

530 Learning in the Liberal Arts (2) Builds upon read-
ings, presentations, and discussions of 510 and 520
by reflecting on them in distinct but related contexts—
classroom, region called Appalachia, and perspec-
tives and experiences associated with liberal arts.

Special Services Education

(College of Education)

MAJORS

DEGREES

Special Education...........................................M.S.
Rehabilitation Counseling.............................Ph.D.

Laurence J. Coleman, Head

Professors:
L. J. Coleman, Ph.D. Kent State; E. E. Doll
Emeritus), Ph.D. Pennsylvania; R. M. Frey,
Ed.D. Illinois; T. George, Ed.D. Tennessee;
C. H. Hargis, Ed.D. Colorado State;
R. F. Kronick, Ph.D. Tennessee; J. H. Miller,
Ed.D. Auburn; W. J. Schindler, Ph.D. Kent
State; W. E. Woodrick, Ed.S. Mississippi
State.

Associate Professors:
S. M. Benner, Ed.D. Columbia; J. L. Cassell,
Ph.D. Kansas; C. R. Colvin, Ed.D. Virginia;
M. C. Hannum, Ed.D. Northern Colorado;
K. H. Kopp, Ph.D. George Peabody;
P. A. McClam, Ph.D. South Carolina;
P. W. Mulkey, Ph.D. Florida State; O. Welch,
Ed.D. Tennessee; M. R. Woodside, Ed.D.
Virginia Polytechnic Institute.

Assistant Professors:
J. D. McLean, Ph.D. Chicago; K. M. Warden,
Ph.D. Tennessee.

Instructors:
D. H. Ashmore, M.S. Tennessee; M. Griffin,
M.S. Tennessee; G. D. Tyler, M.S.
Tennessee.

Lecturer:
H. L. Byrd, Jr., M.S. Tennessee;

The Department of Special Services Edu-
cation offers graduate programs leading to
the Master of Science with a major in Spec-
cial Education or in Rehabilitation
Counseling. The department also partici-
pates in the Doctor of Philosophy program in
Education as described under Education.

A new curricular area, Human Services,
has joined the department and the faculty
will share in teaching cross-disciplinary
courses in special education and in rehabilita-
tion.

THE MASTER'S PROGRAMS

The Master's program in Special Education offers concentrations in the following
areas: 1) hearing impaired; 2) gifted; 3) learning disabilities; 4) mental retardation;
5) multiple disabilities; 6) socially or emotionally maladjusted; and 7) general special education.

Teacher certification can be obtained while working toward the Master's degree. Course offerings are available that lead to general special education teacher certification and
to certification to teach hearing impaired chil-
dren.

The Rehabilitation Counseling program enables counselors to acquire competencies which facilitate the movement of a person with disabilities toward optional 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 a minimum of four semesters, including summer, in
classwork and in internships.

Both majors have a thesis and non-thesis option. If a student elects to do a thesis, the
Master's program will contain a minimum of 30 semester hours including 6 hours of
Thesis 500. Eighteen semester hours in special education course work is required.

The non-thesis option requires a minimum of 18 semester hours total with a minimum of 18 in special education. In the non-thesis option, a final written comprehensive with an
oral examination is required.

ADDITIONAL PROGRAMS

Under the sponsorship of the Office of Special Education and Rehabilitative Serv-
ces (R.S.A.), a specialized institute for the
preparation of professionals to adapt their
skills toward services to hearing impaired
and deaf people is provided.

Details concerning each program can be
obtained by writing to the department head.

Special Education

410 Pre-Internship Seminar (1) Orientation, objec-
tives and policies of internship program. Must be
completed immediately preceding internship.
Prereq: Admission to teacher education program. S/NC only. Sp,Su

423 Communication Processes for the Hearing
Impaired (3) Expressive and receptive vocabulary
development in sign communication. Fingerspelling
and educational applications of sign language.

424 Nature of Hearing Impairments (3) Basic princi-
ples of audiology; anatomy and physiology of hearing;
nature and causes of hearing loss; methods and instru-
mentation for assessment of hearing level; interpretation
of audiologic services to medical and other rehabilita-
tive disciplines.

425 Introduction to the Psychology and Education of the Hearing Impaired (3) Primarily for those plan-
ing to teach hearing impaired. Overview of research related to psychology, social adjustment, communi-
cation methodology, language development and education of hearing impaired. Survey of literature.
Visits to programs. (Same as Audiology and Speech Pathology 425.)

433 Clinical Practice in Speech-Language Pathology
(1-4) (Same as Audiology and Speech Pathology 433)

434 Clinical Practice in Speech-Language Pathology
(1-4) (Same as Audiology and Speech Pathology 434)

440 Voice Disorders (3) (Same as Audiology and Speech Pathology 440)

451 Psychology and Education of the Mildly Handi-

Special Services Education/Fields of Instruction 145
capped (3) Nature and characteristics of mildly handicapped students with learning disabilities, emotional disturbances, and other exceptionalities. Instructional approaches, techniques, and evaluation and development of materials. Coreq: 480. F

452 Psychology and Education of the Moderately and Severely Handicapped (3) Nature and characteristics of children and youth with moderate and severe handicapping conditions, and educational strategies necessary to accommodate them. Traditional and innovative educational practices. Coreq: 490. Sp

454 Education of the Gifted and Talented Children (3) Orientation to psychometric and behavioral studies of giftedness: Analysis of past and present school practices in reference to curriculum and program implementation. Sp

456 Speech and Language Basis of Learning Disabilities in the Classroom (3) Normal communication development; understanding of speech and language impairments in school-age students; integration of oral/ written communication skills into existing curricula, especially for high incidence special education students.

470 Psychology of the Exceptional Child (3) Varieties of exceptional children; general characteristics and educational needs. Implications of developmental- ly appropriate education for children and youth as adults. Opportunity to expand study upon particular exceptionality. Enrollment limited to non-special education majors.

471 Internship I: Special Education (3-15) Intensive experience designed to allow student to practice art and psychology of education of children and youth with moderate and severe handicaps. Practicum experiences.

472 Audiology II (3) (Same as Audiology and Speech Pathology 473.)


481 Policies, Procedures, and Practices in Special Education (3) Comprehensive review of Federal and State laws and regulations which direct implementation of special education programs in all public and private facilities and agencies. Multiple service delivery models. Sp

482 Speech and Language Services in the Schools (3) Organization and implementation of speech and language programs in schools; IEP process as it affects assessment, case-selection, and programming for students age 4-21. Procedures and materials, group intervention, and classroom consultation.

483 Clinical Practice in Communication Disorders in Schools (3) Supervised practice with children with communicative disorders. Coreq: 453, 454, 80-100 clinical contact hrs. Sp

484 Internship with Hearing Impaired Children (6) Supervised practicum with preschool, day school and residential students.

490 Field Experience with Moderately and Severely Handicapped Students (3) On-site teaching experience with moderately and severely handicapped children and youth. Coreq: 452. 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 and/or final semester. Prerequisite: University faculty and/ or faculty time before degree is completed. May not be used toward degree requirement. May be repeated. S/J/N only. E

503 Problems in Lieu of Thesis (1-9) May be repeated. May be used toward degree requirement. E


506 Internships in Teaching in Special Education and Rehabilitation (3-15) Placement in professional settings in public schools or agencies under supervision of master practitioners. Enrollment limited to those in fifth-year program. S/N only.

509 Vocational Guidance and Career Planning With Hearing Impaired (3) Utilization of psychological, educational, social, vocational, and diagnostic materials and resources appropriate for hearing impaired persons to provide guidance in career decisions on individualized and/or group basis. Coreq: 519. Sp

519 Speech Development of Hearing Impaired (4) Theories of speech development, approaches in training perception and production of speech, and aural habilitation. Practicum experiences.

521 Language Development of Hearing Impaired I (3) Language development of hearing impaired contrasted with scope and sequence of normal language development. Formal linguistic systems used to describe language development problems.


523 Practicum in Hearing Impairment (3) Receptive and expressive language capabilities of hearing impaired student. Designing, teaching, and post-testing unit of instruction for remediation of specific language errors. Prereq: 522.

524 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in theoretical and applied linguistics. Prereq: 521, 522, 523, 529.

525 Manual Communication (3) American Sign Language (ASL) and culture of American deaf community. Acquisition of basic linguistic principles of ASL, cultural differences between hearing and deaf community, and vocabulary development. Prereq: Prior sign language experience or consent of instructor.

526 Advanced Sign Language (3) Intermediate ASL stressing fluency, and receptive and productive communication with deaf people and structure and history of language. Prereq: 525 or equivalent.


529 Teaching Reading to the Hearing Impaired (3) Specific methods necessary to teach the prelingually hearing impaired student. Practice in preparation of developmentally appropriate reading materials. Methods which assist in integrating hearing impaired students in regular reading curricula and materials. Prereq: 521.

530 Orientation to Rehabilitation (3) History, philosophy, legal and economic bases, current issues, and practices in public and private rehabilitation programs. Qualifications of service providers. Assessment, planning, development, and delivery of services to people who have disabilities and vocational handicaps. Identification, mobilization, and utilization of rehabilitation resources.

532 Casebased Management in Rehabilitation (3) Techniques and procedures involved in management of cases/ based in Federal-State vocational rehabilitation agencies, private rehabilitation companies, and public or private rehabilitation facilities. Analysis of appropriate industrial management models related to rehabilitation programs.

533 Job Analysis, Development, and Placement (3) Determining employment readiness of people with disabilities, identifying appropriate jobs for selected clients, and assisting clients in seeking, obtaining, and retaining employment. Job analysis, job identification and classifying, and employer-serving techniques; legislation impacting job placement; supported work; and use of occupational information.

535 Vocational Evaluation: Statistical Methods (3) Procedures and techniques used to determine vocational assets and liabilities to people with disabilities. Functional analysis of biographical and interview data. Interpretation of data from personality, intelligence, and other psychological tests. Application of computer techniques to vocational assessment and planning.

537 Vocational Evaluation: Clinical Methods (3) Process, principles, and techniques used to communicate and understand the own work behavior and vocational potential. Selection and use of occupational exploration programs and work samples; application of situational tasks, job tryouts, and simulated work experiences in vocational evaluation. Clinical interpretation of vocational interview, vocational counseling, and report writing.

539 Transition from School to Work (2) Development of programs and procedures to facilitate adjustment of exceptional persons to independent living. Evolving expectations of work, attributes of effective programs, and interface between school-based programs and rehabilitation agencies.

541 Psychosocial Aspects of Exceptionalities (3) Psychosocial impact of exceptionality on person and family. Reaction to loss, coping with disability, and societal rehabilitation.

543 Medical Aspects of Disability (3) Etiology and clinical symptoms related to disabilities caused by special education and rehabilitation personnel. Restrictive measures to eliminate or minimize resulting handicaps. Skills necessary to communicate with lay and professional persons.

545 The Rehabilitation Interview (3) Interview as used in assessment and placement of people who have disabilities and vocational handicaps.

547 Practicum in Rehabilitation (3) Supervised experience in area of rehabilitation; application of concepts, principles, and skills. Prereq: Consent of instructor.

549 Internship in Rehabilitation Counseling (12) Supervised practice in rehabilitation counseling for 450 level students with 3 clinical experience for second-year students (600 clock hrs required).

551 Psychology of Learning Disabilities (3) Overview of learning disabilities; review of field's historical perspectives and emerging direction; basic theories of learning disabilities; medical aspects of research, assessment and treatment; characteristics of children and youth, educational implications.

552 Instructional Systems for Learning Disabilities (3) Informed assessment for determining what and how to teach, data collection, instructional programming, and decision-making related to nature and needs of persons with learning disabilities.

553 Assessment of Exceptional Students (3) Historical and legal issues related to assessment; concepts of evaluation models; test instruments and assessment processes demonstrated, practiced, results applied to educational programming; basic statistics relative to norm and criterion-referenced testing covered. Coreq: 553. F

555 Characteristics of Social and Emotional Disturbances in Children and Youth: Identification, symptoms of disturbed child compared and contrasted to normal social and emotional growth.

556 Instructional Systems for the Emotionally Disturbed and Intellectually (3) Educational strategies and models of instruction; simulation, demonstration, and media. Teaching techniques, materials, and teacher/ pupil interactions. Therapeutic forms of education through art, music, role play, puppetry, bibliotherapy, and group interactions.

558 Neuromuscular and Health Disorders: Educational Implications (3) Neuromuscular impairments, physical disabilities, and special health conditions, autism, investigation of instructional techniques and adaptations.

561 Psychology of Mental Retardation (3) Psychological, social, legal, and ethical issues relative to mental retardation.

562 Instructional Systems for the Mentally Retarded (3) Specific developmental, behavioral strategies and techniques. Curricular design techniques and evaluation. Educational needs of mentally retarded children and youth.

564 Psychosocial Development of Gifted and Talented Children: Identification, characteristics, strengths, needs, and implications of home, school, and society. Implications of modification. Practices for promoting social and emotional development.
565 Instructional Systems for the Gifted and Talented (3) Instructional methods and systems evaluated in terms of effectiveness in various educational environments.

569 Early Intervention for Handicapped Children (3) Exploration of characteristics and needs of young handicapped children. Program and curricular development of early intervention system.

575 Creative Problem-Solving Strategies for Special Educators (3) Techniques for solving problems encountered by special educators in any setting.

579 Special Topics (1-3) Prereq: Admission to graduate program. May be repeated. Maximum 9 hrs. S/NC or letter grade.

585 Seminar in Research Techniques in Special Education (3) Evaluation of appropriate research methodologies with handicapped populations.

587 Seminar: Issues and Theories in the Education of the Exceptional Child (3) Current trends; Analysis of timely research and theoretical issues. Prereq: Research course or consent of instructor.

590 Application of Microcomputer Technology in Special Education and Vocational Rehabilitation (3) Application of microcomputer technology with all categories of exceptionalities and across all chronological and functioning age ranges. Microcomputer adaptive software, special switch access, authoring systems, telecommunication, and strategies for cognitive development.


596 Clinical Experience in Assessment and Instruction (3) Academic remediation applied in lab/field setting; tasks related to teaching; assessment, preparation of lessons, and delivery of instruction. Coreq: 553. F

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

601 Seminar in Educational Theories in Special Education and Rehabilitation (3) Education theories; education and rehabilitation of exceptional persons. Theory applications in educational settings. Prereq: Admission to doctoral program or consent of instructor.

602 Seminar in Social Processes in Special Education and Rehabilitation (3) Social phenomena which influence impact of disability on person and on significant others. Implications for habilitation. Prereq: Admission to doctoral program or consent of instructor.

603 Seminar in Research in Special Education and Rehabilitation (3) Development and implementation of research, independent research studies. Research proposals. Prereq: 9 hrs of research core and consent of instructor.

610 Internship in College Teaching and Supervision (3-9) Supervised practice in college teaching and supervision. Prereq: Admission to doctoral program or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

620 Internship in Research in Special Education and Rehabilitation (3-9) Placement with professional engaged in theoretically-based research: public school, institutions, agencies or university settings. Prereq: 9 hrs in statistical and research methods. May be repeated. Maximum 9 hrs. S/NC only.

630 Internship in Institutional Leadership in Special Education and Rehabilitation (3-9) Advanced level 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 Communications (College of Liberal Arts)

Professors:

Associate Professors:
M. L. Ambrester, Ph.D. Ohio State; J. E. Buckley, Ph.D. Northwestern; N. C. Cook, M.A. Alabama; R. W. Glenn, Ph.D. Northwestern.

Assistant Professor:
R. S. Ambler, Ph.D. Ohio State.

Graduate courses in Speech Communications 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.

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) Organization setting and variables of communication process that affect quality of human interaction both within and outside organization. May be repeated. Maximum 6 hrs.

460 History of Rhetorical Theory (3) Western rhetorical theory from Plato to present.

485 Studies in Rhetorical History and Criticism (3) Historical and critical study of public address. May be repeated. Maximum 6 hrs.

486 Rhetoric of the Women’s Rights Movement (3) Historical and critical study of public address in campaign for women's rights from 1830's to present. (Same as Women’s Studies 486.)

470 Theories of Argumentation (3) Studies of conceptual bases of argumentation from classical to contemporary theorists. Prereq: Consent of instructor.

480 Ensemble Interpretation (3) Study and presentation of literary texts through group performance.

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

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

505 Fundamentals in Graduate Research in Speech (3) Techniques of historical, descriptive and experimental research.

510 Studies in Persuasion (3) Prereq: 310 or equivalent or consent of instructor.

530 Topics in Group and Interpersonal Communication (3) Prereq: 330, 330, 420, or consent of instructor. May be repeated. Maximum 6 hrs.

550 Communication Theory (3) Analysis of contemporary theories of human communication; similarities and differences of communication processes in interpersonal, intergroup, small group, organizational, and public communication. Prereq: 350 or equivalent or consent of instructor.

Statistics (College of Business Administration and Intercollegiate Program)

MAJORS

DEGREES

Statistics..................................................M.S. Business Administration................................MBA

D.L. Sylwester, Chair

Professors:
D. S. Chambers (Emeritus), MBA Texas; R. A. McLean, Ph.D. Purdue; J. W. Philpot, Ph.D. Virginia Polytechnic Institute;
D. L. Sylwester, Ph.D. Stanford;
C. C. Thigpen, Ph.D. Virginia Polytechnic Institute.

Associate Professors:
G. B. Ranney, Ph.D. North Carolina State;
R. O'Brien, Ph.D. North Carolina;
R. D. Sanders, Ph.D. Texas; M. S. Younger, Ph.D. Virginia Polytechnic Institute.

Assistant Professors:
M. G. Leitnaker, Ph.D. Kentucky;
J. L. Schmidhammer, Ph.D. Pittsburgh.

Intercollegiate Program Committee:
D. L. Sylwester (Chair), Statistics;
H. Fribourg, Plant and Soil Science;
S. W. Huck, Educational and Counseling Psychology; M. Leitnaker, Statistics;
J. B. McLaren, Animal Science; R. McLean, Statistics;
C. Thigpen, Statistics; M. S. Younger, Statistics.

THE MASTER'S PROGRAM

The Master'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 a statistics Master's program, the department offers a concentration in industrial statistics, which provides unique opportunities for experiences in practi-
tical 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 cooperation with industry. Students may supplement their classroom study with an industrial internship and participation in research projects dealing with industrial problems. Collaborative research efforts by other department faculty with faculty from other fields, such as the College of Agriculture and the Knoxville Unit of the College of Medicine, provide the student with the opportunity to gain experience as a research assistant. 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 course work 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.

Curriculum
A minimum of 33 credit hours must be completed for the Master's degree. Required of all students are 8 hours in statistical methods, 8 hours in statistical theory, 1 hour in statistical computing, and 3 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. A maximum of 9 thesis hours may be applied toward the M.S. degree.

Comprehensive Examination
Students must pass a written comprehensive examination covering statistical methods and theory. 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 or a graduate degree. The program enables a student to obtain the M.S. in Statistics alone or simultaneously with the Ph.D. or Ed.D. in another department. The program also enables a student to obtain a Statistics minor along with the M.S., Ph.D., or Ed.D. in another department. The program is administered by an executive committee with advisory input from the program faculty. The program is open to well qualified graduate students in all departments which have an approved Statistics minor and/or joint major curriculum offered through the program. Curriculum requirements for the statistics component of all joint degree are specified in terms of completion of alternative sequences of course options. Course options consist of courses in statistics, offered either by the Department of Statistics or by other departments, that have been reviewed and approved by the Executive Committee. Interested students should contact their major department head for information on specific course requirements.

General Admission Requirements
1. The student's sponsoring department must have established with the executive committee an approved joint degree program along with specified sequences of statistics courses taught by the Statistics Department and/or other departments.
2. The student's Admission to Candidacy form must contain all courses required for the Statistics minor/major set off in a group and labeled "Statistics courses required for the minor/major.'
3. In many cases, a student may not decide to apply for participation in the program until he/she has completed two or three statistics courses. In that case the student's major professor should file a program change with the cooperating departments and assist the student in obtaining a Statistics Department faculty member to serve on the student's committee.

Degree Requirements
The program offers the M.S. in Statistics with a minor in another department, a joint major program in which the student earns a Master's or doctoral degree in the student's sponsoring department along with the M.S. in Statistics, and a joint major and minor program in which the student earns a Master's or doctoral degree in the student's sponsoring department along with a minor in Statistics. The table below presents the minimum number of semester hours in statistics for each of these options. The student's committee 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>Program</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.S. in Statistics, minor outside of Statistics</td>
<td>21</td>
</tr>
<tr>
<td>M.S. outside of Statistics, minor in Statistics</td>
<td>8</td>
</tr>
<tr>
<td>M.S. outside of Statistics, major in Statistics</td>
<td>21</td>
</tr>
<tr>
<td>Doctorate outside of Statistics, minor in Statistics</td>
<td>16</td>
</tr>
</tbody>
</table>

*Approved Statistics courses from the Department of Statistics and/or other departments.

Courses taken for the minor or the Master's degree in Statistics may fulfill requirements for the doctoral degree. Contact the home department for details.

BUSINESS ADMINISTRATION CONCENTRATION
For complete listing of MBA program requirements, see Business Administration.

MBA Concentration
Statistics
Minimum Course Requirements for MBA Concentration: Prereq or coreq: 561.
Requirements: 571, 566, 572.

411 Introduction to Statistical Computing (3) Use of computer operating system commands and packaged programs for statistical analysis and file management. Not available for credit for statistics majors. Prereq: 201 or 251.


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

501 Statistics for Management (3) Fundamentals of descriptive and inferential statistics. Introduction to probability models, statistical inference: statistical process control, correlations and regression, time series open only to MBA students.

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.

531 Statistical Methods for the Social Sciences I (3) Probability distributions, sampling distributions, parametric and nonparametric estimation and hypothesis testing, simple linear regression and correlation. Credit not given for both 531 and 537. Prereq: 1 year college mathematics and 1 course in statistics.

532 Statistical Methods for the Social Sciences II (3) Multiple regression and correlation, use of dummy variables, general linear model, analysis of variance and covariance. Prereq: 531.

537 Statistics for Research in the Behavioral and Biological Sciences I (3) Principles and applications of statistical methodology, integrated with considerations of major statistical computing system. Probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation. Career in research. Credit not given for both 531 and 537. Prereq: 1 year graduate mathematics and 1 undergraduate statistics course.

538 Statistics for Research in the Behavioral and Biological Sciences II (3) General linear model as applied to multiple regression and analysis of variance. Diagnostic and influence techniques, one-way, factorial, blocking, and nested designs, preplanned versus post-hoc contrasts. Random factors and repeated measures. Prereq: 537.

561 Introduction to Computing for Data Management and Analysis (1) UT computing environment for beginning graduate students. Operating system commands, system editor, utility programs and major statistical package, SAS, for data entry and editing, file management, and statistical analysis in interactive and batch environments, IBM, CMS, and MVS. Use of microcomputers for statistical analysis. Coreq: 531, 537, or 571, or consent of instructor.

564 Theory of Statistical Inference (3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 563.

566 Statistical Techniques in Industrial Processes (3) Applications of control charts and other statistical techniques in industrial settings. Attributes and variables control charts, process capability analysis, aspects of sampling, statistical tolerancing, estimation of variance components, problems of measurement, special industrial applications. Prereq: 571 or equivalent.


572 Applied Linear Models (3) Simple and multiple linear regression using matrix algebra and general linear model; polynomial regression, weighted least squares regression, variable selection techniques, multicollinearity, regression diagnostics; general linear model approach to analysis of data from designed experiments. Use of standard computer packages. Prereq: 571 and matrix algebra.

573 Design of Experiments (3) One-way ANOVA, multiple range tests, equal and unequal variances, transformations; factorial experiments, completely randomized designs, analysis of covariance, split-plot designs, factorial fractional, sequential designs. Prereq: 571.

585 Principles of Statistical Process Management (3) Control charts and other statistical techniques applied to management of business processes. Prereq: Consent of department head.

587 Graduate Seminar (1) Directed readings and active participation in colloquium program of Department of Statistics and of student’s minor program. Prereq: Consent of statistics department director of graduate studies. May be repeated. Maximum 2 hrs. S/NC only.

592 Internship (1-6) Supervised off-campus experience in application of statistical principles and methods in business, industry, or government. Written and oral report. Prereq: 4 courses in graduate-level statistics and consent of department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC only.

593 Independent Study (2-4) Faculty directed readings and investigation of specified topic in probability or statistics. Written report and oral presentation. Prereq: 2 courses in statistics and consent of the statistics department director of graduate studies. May be repeated. Maximum 6 hrs. S/NC or letter grade.

595 Statistical Consulting Practicum (1-4) 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 report and/or detailed diaries. Prereq: 572 or 538. May be repeated. Maximum 6 hrs.


673 Linear Models (3) Review of full rank models and models not of full rank with application to unbalanced designs, estimation of variance components, estimable functions, blu.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.

### Technical and Adult Education

**MAJORS**

- **DEGREES**
  - Adult Education
  - Business Education
  - Industrial Education
  - Vocational-Technical Education

**PROFESSORS**


**ASSOCIATE PROFESSORS**


**ASSISTANT PROFESSORS**

R. Pierce, Ph.D.; Ohio State; T. L. Powell, M.S.; Oklahoma.

**INSTRUCTOR**

C. W. Wright, M.T.; Arizona State.

### THE MASTER'S PROGRAM

The Department of Technological and Adult Education offers graduate programs leading to the Master of Science with majors in Vocational-Technical Education, Adult Education, Business Education, and Industrial Education. Each of the degrees has two options: a thesis option requiring a minimum of 33 hours and a non-thesis option requiring a minimum of 36 hours. The Vocational-Technical Education major is available with concentrations in business and office education, distributive and marketing education, industrial education, industrial training, and technical education. Details and specific requirements for the various degree options may be obtained from the coordinators of the service areas.

### THE DOCTORAL PROGRAM

The Ed.D. program is a cooperative undertaking involving all vocational service areas. Concentrations are available in agricultural, business, marketing and distributive, home economics, industrial, and technical education, and in general vocational education. The degree requires a minimum of 80 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; department core and electives, 21 hours; cognate field, 9 hours; professional education core, 9 hours; research techniques, 12 hours; and dissertation, 24 hours. A minimum of 90 hours above the baccalaureate is required.

The Doctor of Philosophy with a major in Adult Education includes concentrations and specializations as listed under education.
456 Organization and Operation of VICA/HOSA (3) Planning, implementing and operating youth- and adult-oriented technical educational programs. Prereq: Senior standing or consent of instructor. Sp,Su

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

502 Registration for Use of Facilities (3) 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) May be repeated. Maximum 6 hrs. S/NC only. E

504 Research in Technological and Adult Education (3) Solution of problems encountered in technological and adult education. Review of studies unique to technological and adult education. Prereq: 12 hrs of graduate credit. F,Su

505 Follow-up Procedures in Technological and Adult Education (3) Procedures and methods utilized in obtaining, analyzing and reporting follow-up data appropriate for making vocational program improvements. Prereq: Consent of instructor. Sp,Su

506 Adult Continuing Education: A General Survey (3) Historical development, psychology, philosophy, and psychological foundations of vocational, technical and adult education: fundamental principles and contemporary objectives. Prereq: Consent of instructor. F,Su

507 Student Selection and Placement in Vocational and Technological Programs (3) Methods and procedures in establishing criteria for student selection and placement in vocational-technical programs and in jobs. Role of occupational teachers in guidance programs. Prereq: 460. F,Su

509 Internship in Technological and Adult Education (3) Practical field experiences in selected settings under supervision of practitioner and departmental representative. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

510 Foundations of Technological and Adult Education (3) Historical, philosophical, economical, social, and psychological foundations of vocational, technical and adult education: fundamental principles and contemporary objectives. Prereq: Consent of instructor. F,Su

511 Issues and Trends in Technological and Adult Education (3) Academic, socioeconomic, cultural, and other handicaps of special students. Prereq: 9 hrs of graduate credit. F,Su

512 Special Topics in Technological and Adult Education (1-3) Specific objectives, activities, and evaluation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

514 Individual Study in Technological and Adult Education (3) Prereq: Consent of supervising instructor. Approval form must be filed in office of department head. May be repeated. Maximum 6 hrs. E

515 Microcomputer Operations and Programming in Education (3) Operations and practice of BASIC programming for education and selected applications. Hands-on experience in operating and programming microcomputers, writing, debugging, and running educational programs and data files. Prereq: Teaching of administrative, or related experience in education or training, or consent of instructor. E

516 Microcomputer Software Development (3) Advanced software design in BASIC: random access and binary files, search and sort applications, handle output and graphical outputs, and bit-mapped graphics for educational environment. Hands-on learning and program development. Prereq: 515 or consent of instructor. E

518 Education Specialist Research and Thesis (3) May be repeated. Maximum 9 hrs. P/NP only. E

521 Program Development and Operation in Technological and Adult Education (3) Theories and methods from research to practice in planning and operating adult education programs. Prereq: Consent of instructor. F,Su

522 Adult Development (3) Changes in characteristics of adults over life span and implications for adult education. Prereq: Consent of instructor. F,Su

523 Post-Secondary Education for Adults (3) History, evolution, philosophy, structure and functions of post-secondary, sub-university institutions, their programs and clientele. Prereq: Consent of instructor. Sp,Su

524 Continuing Professional Education (3) Theories and concepts supporting design and management of educational programs for adults in professions. Prereq: 510 or equivalent. E

530 Methods and Materials for VOE Programs (3) Development of instructional aids, recent developments and research, individualized instructional, and occupational clusters. Prereq: 516 or equivalent. Sp,Su

531 Organization and Supervision of VOE and Marketing Programs (3) Developing office and marketing 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 implications for improved instruction at both secondary and post-secondary levels. Prereq: 12 hrs of graduate credit. Sp,Su

533 Improvement of Instruction in Office Technological Education (3) Research, evaluation, issues, and materials in typewriting, wordprocessing, business communications, and office procedures. Prereq: Consent of instructor. Su

534 Improvement of Instruction in Accounting and Data Processing (3) Principles of learning, issues, research findings and materials in basic accounting, automated accounting and data processing at secondary and post-secondary levels. Prereq: Consent of instructor. F,Su


536 Organizing and Teaching Adult Business and Marketing Education (3) Planning, organizing, promoting, teaching and evaluating continuing education programs in business and marketing education; utilizing trade associations, employment agencies, business groups, and advisory committees in program implementation. Prereq: 3 yrs teaching experience and consent of instructor. F,Su

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 of experiences in non-traditional settings for business and marketing teachers. Prereq: 15 hrs of graduate credit. E

542 Problems in Business and Marketing Education (3) Selective research problems in teaching of business and marketing education and related areas. Prereq: Consent of instructor. E

550 Administration of Industrial Education Programs (3) Developing, staffing, administering and evaluating trade, industrial and technical education programs in secondary and post-secondary school settings. Prereq: Consent of instructor. Sp,Su

551 Supervision of Industrial Education Programs (3) Techniques used to improve industrial education programs. Staff development, curriculum improvement, and program monitoring techniques. Prereq: 455 or equivalent. F,Su

552 History and Philosophy of Industrial Education (3) Social, political, and economic events that impact development of industrial education. Philosophical problems, justification, values, principles and concepts of industrial education. Prereq: Consent of instructor. F,Su

553 Planning Technical Education Facilities (3) Preparation of educational specifications, site selection, and working relationships with other professionals involved in process of planning technical-education facilities. Prereq: Consent of instructor. Sp,Su

554 Technical Program Planning (3) Instructional systems needed to analysis, design, development, implementation, and evaluation of trade, technical supervi- sor and related teaching. Prereq: Curriculum development course and consent of instructor. F,Su

555 Curriculum Planning for Industrial Education Programs (3) Defining, selecting learning tasks, criterion, referenced instructional programs. Prereq: 374 or 554 or consent of instructor. Sp,Su

556 Staff Development Programs (3) Strategies for assessing, planning, and implementing programs for professional development of vocational-technical personnel. Prereq: 551 or consent of instructor. Sp

557 Advanced Methods of Teaching Technical Subjects (3) 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,Su

559 Evaluation of Technical Training Programs (3) Internal and external evaluation of training programs to maintain quality control and/or to justify revisions. Prereq: 455 and consent of instructor. E

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 standardization capability, techniques for training hourly workers in quality control, and measurement procedures for quality control. Prereq: Statistics course and consent of instructor. F,Su

572 Advanced Training Methods for Industrial Productivity (3) Techniques of training hourly workers in use of statistical process control tools. Techniques for involving hourly workers and supervisors in quality assurance, inventory control, and productivity improvement group. Prereq: 571. Sp,Su

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

601 Curriculum Planning in Technological and Adult Education (3) Curriculum theory, models, concepts, planning evaluation and implementation of specialized program areas. Prereq: 555 or equivalent. Sp,Su

602 Planning and Evaluation of Programs in Techni- cal 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 doctor-al residency. May be repeated. Maximum 3 hrs. S/NC only. E

605 Administration and Supervision of Technologi- cal and Adult Education (3) Leadership, policy, organization, planning, personnel, student development services, and budgeting related to vocational, technical and adult education at secondary, post-second- ary, and other levels. Techniques of system solving, and management activities. Prereq: Administrative theory course and consent of instructor. F,Su

610 Research Development in Technological and Adult Education (3) Proposal development, theoretical base, research design, sampling, application of statistics, and evaluation of research in technological and adult education. Prereq: Statistics courses and consent of instructor. Sp,Su
Textiles, Merchandising and Design/Fields of Instruction

(College of Human Ecology)

MAJORS

Interior Design ........................................... M.S.
Textiles and Apparel .................................... M.S.
Human Ecology ........................................... Ph.D.

Jacquelyn O. DeJonge, Head

Professors:
R. G. Blakemore, Ph.D. Florida State;
A. J. DeLong, Ph.D. Pennsylvania State;
J. O. DeJonge, Ph.D. Iowa State;
M. F. Drake, Ph.D. Pennsylvania State;
K. E. Duckett, Ph.D. Tennessee;
W. J. Moran, M.S. Wisconsin;
L. C. Wadsworth, Ph.D. North Carolina State.

Associate Professors:
R. R. Bressee, Ph.D. Florida State;
C. L. Dyer, Ph.D. North Carolina; I. M. Ford,
Ph.D. Pennsylvania State.

Assistant Professors:
F. Calogero, Ph.D. North Carolina State;
J. L. Crouse, Ph.D. North Carolina State;
S. J. Dillard, M.S. Florida State; J. B. Havaas,
Ph.D. Ohio State; T. L. Houser, M.S.
Tennessee.

Interior Design

The Department of Textiles, Merchandising
and Design offers a Master's degree in
Interior Design. To enter the program, stu-
dents are expected to have a good
foundation in this area. The program of
study will prepare students for careers with
interior design or architectural firms, public
and private agencies, and educational institu-
tions. Interested students should contact the
department head for more information.

Prospective graduate students pursuing a
degree in advanced interior design should
submit a portfolio of their undergraduate
studio work to the department. This portfolio
may include slides or original work.

ACADEMIC STANDARDS

1. Evaluation of student progress will nor-
mally occur prior to enrollment for the
hours and during the second semester of full
time enrollment in interior design. The review
of the student will be undertaken by the inte-
rior design faculty with consideration given
to factors such as: GPA (minimum 3.0), por-
tfolio evaluation, and demonstrated research
capability.

2. If progress or performance is deemed
insufficient, the faculty may recommend pro-
bation with specific goals set for a specified
time or termination.

THE MASTER'S PROGRAM

Major (Required courses: 510,
552,562, 564, 590)
18-21 hours

Cognate Area
9 hours

Research Methods
3 hours

Thesis
6 hours

TOTAL
36 hours

A comprehensive oral examination, admin-
istered by the thesis committee, will occur
upon completion of thesis research. A non-thesis option is not available.

410 Environment as Code (3) Advanced theoretical
issues in considering environment as medium of human
communication. Prereq: 200, 400 or consent of instruc-
tor. Sp,A

475 History of American Interior Architecture (3)
Major styles of interior architecture, decoration, and deco-
orative arts within cultural context; colonial through
nineteenth century. European influences. Prereq: 370 or
consent of instructor. Sp,A

500 Thesis (1-19) P/NP only. E

502 Registration for Use of Facilities (3-19) Required
for the student not otherwise registered during any
semester when student uses University facilities and/
or faculty time before degree is completed. May not
be used toward degree requirements. May be repeat-
ed. S/NC only. E

510 Problem Solving in Interior Design (3) Use of
systematic design methodology and design research
methods as part of design problem-solving experi-
ence. Lecture and studio. May be repeated. Maximum
8 hrs. Prereq: Admission to graduate program. Pr,

520 Integrative Interior Design Studio (3) Identification,
integration and synthesis of multidisciplinary data input.
Advanced programming techniques and design eval-
uation. Lecture and studio. Prereq: 510, 564, or consent of
instructor. Sp

530 Practicum in Interior Design (1-12) Field experi-
ence in selected agencies, organizations, or firms that
focus on solutions to problems in interior design. Prereq:
9 hrs graduate level interior design or consent of
instructor. E

531 Research Methods in Historic Preservation (3)
Methodology for historic preservation problems in inte-
rior design. Prereq: Architecture 403 or consent of
instructor. Sp

542 Special Topics: History of American Interior Design
(3) Philosophical and stylistic movements, America of
seventeenth, eighteenth, or nineteenth centuries. Topics
vary. Prereq: 475 or consent of instructor. May be
repeated. Maximum 9 hrs. F

552 Seminar in Interior Design (3) Twentieth-century
design concepts, persons, motivation, and creative
components leading to visual innovation. Prereq: 479 or
consent of instructor. F

562 Research Methods in Interior Design (3) Meth-
odological approaches appropriate to interior design.
Prereq: 9 hrs of graduate level interior design or con-
sent of instructor. May be repeated. Maximum 9 hrs.
E

564 Environmental Factors in Interior Design (3)
Human factors and associated research techniques and design
methodologies related to interior architectural envi-
ronments. Design requirements from anatomy,
physiology, anthropology and social and behavioral
sciences. Prereq: 6 hrs behavioral science and 6 hrs
natural science, or consent of instructor. Sp

574 Environmental Design Analysis (3) Integrative
problem-solving/studio from multidisciplinary perspec-
tive. Systems approaches. Available to students from
design disciplines and social and behavioral sci-
ences. Prereq: 554 or consent of instructor. May be
repeated. Maximum 6 hrs. F,A

580 Directed Study in Interior Design (1-3) Independent
advanced research in selected areas from field of
interior design. Prereq: Consent of instructor. May be
repeated. Maximum 9 hrs. E

581 Directed Study in Historic Preservation (1-3) Inde-
pendent advanced research in historic preservation
relevant for interior design. Prereq: Consent of instruc-
tor. May be repeated. Maximum 9 hrs. E

582 Directed Study in Historic Design (1-3) Independent
advanced research in area of historic stylistic move-
ments in interior design. Prereq: Consent of instructor.
May be repeated. Maximum 9 hrs. E

583 Directed Study in Furniture Design (1-3) Inde-
pendent advanced research in furniture design. Prereq:
Consent of instructor. May be repeated. Maximum 9 hrs.
E

584 Directed Study in Environmental Design (1-3)
Independent advanced research in environmental design.
Prereq: Consent of instructor. May be repeated.
Maximum 9 hrs. E

590 Research Seminar (1-2) S/NC only. E

Textiles and Apparel

The Department of Textiles, Merchandising
and Design offers the Master's degree. Stud-
ents are expected to have a good founda-
tion in one of the following areas to enter the
program. The program of study will prepare
students for careers in industry, business,
public and private agencies, and educational
institutions. Interested students should con-
tact the department head for more
information.

ACADEMIC STANDARDS

1. Each graduate student will be evaluated
at the end of the second semester (or after
completing a minimum of 8 graduate
hours).

2. If the student's GPA is below 3.0, the
faculty may recommend probation with
specific goals set for a specified time or termination.

THE MASTER'S PROGRAM
Major (Required courses: 540, 550/552*, 580, 590)
19 hours
Cognate Area
6 hours
Statistics
3 hours
Thesis
6 hours
TOTAL
34 hours

*Students with textile science background must take 550; students without must take 522.

A comprehensive oral examination, administered by the thesis committee, will be given upon completion of the thesis research.

A non-thesis option is not available.

THE PH.D. CONCENTRATION
Students enrolled in the Ph.D. program in Human Ecology with a concentration in textiles and apparel take one common course which provides a foundation for the integration of textiles and apparel in the context of the near environment. A required departmental research seminar exposes students to research being conducted in all areas of study in the department. Textiles and apparel concentration requirements include:

1. Nineteen hours in required textiles and apparel courses: 550, 552, 540, 590, 641, 655, and 695;
2. College Professional Seminar, Human Ecology 610;
3. Research Seminar, 590. Attendance at seminar is required for all full-time students;
4. Nine credit hours in research methods including 6 hours of 500-level statistics;
5. Nine hours in a cognate area;
6. Textiles and apparel courses in area of specialization (15-20 hours); and
7. Dissertation (24 hours).

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 in which the student uses University facilities and/ or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. E/NC only. E
510 International Retail Systems (3) Acquisition and management of information for retail decision; analytical decision making skills. International differences in system planning and design strategies in retail areas. Prereq: 410 or equivalent. Sp
520 Textile Microscopy and Physical Testing (3) Optical and electron microscopy techniques for textile fibers, yarns and fabrics. Methods and equipment used in physical testing following approved textile standards. Prereq: 320 or equivalent. Sp
522 Fiber Chemistry (4) Chemistry of textile fibers; structure, preparation and reactions; dyeing and finishing of fabrics. Introduction to color science. Prereq: Organic chemistry 2, 3 hrs and 4 labs. Sp
524 Advanced Textile Dyeing and Finishing (4) Chemistry, processing and fastness of chemical finishes and various classes of dyes on different fibers. Prereq: 522 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: Engineering Science and Mechanics 321, Mathematics 142, or equivalent. F,A
530 New Technology in the Textile/Apparel Industry
(3) Innovations in equipment which affect textile and apparel industries; computer-aided design and computer applications; improvements which affect U.S. industry competitive edge. Field trips. Prereq: Computer literacy. F
540 Socio-Psychological Aspects of Apparel (3) Apparel and human behavior in social situations. Prereq: 6 hrs or equivalent from sociology and psychology. F
546 Fashion Development in Historic Perspective (3) Style in relation to contemporary conditions (cultural determinants): commerce, economics and social phenomena. Sp
548 International Textiles (2) Development of traditional and historic textiles; influence of culture, economics and commerce. Prereq: 3 hrs textiles. Sp,A
550 Consumer Economics and Market Choices (3) Economic framework for evaluating consumer behavior and consumer choice within market system. Theory of consumer preferences and decision making; consumer demand and demand models for individuals and households. International consumer economics, issues and policies. Prereq: 350 or consent of instructor. F
580 Research Methods in Textiles, Apparel and Design (3) Fundamentals of scientific research methods; issues of applied research in textiles, apparel and interior design. Sp
590 Research Seminar (1) Research topics in textiles and apparel. S/NC only. F,Sp
593 Directed Study (1-3) Individual problems in textiles, merchandising or apparel. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.
595 Advanced Topics in Textiles and Apparel (1-3) Lecture, group discussion on specialized topics: apparel production management, functional design, handicapped/elderly, historic costume, historic textiles, international trade, non-wovens, thermal properties. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs. Su
600 Dissertation (3-15) P/NP only. E
625 Physical Chemistry of Fibers (3) Physical chemistry of fibers and fiber forming polymers; surface chemistry and thermal properties. Prereq: 522, Mathematics 231, or equivalent. Sp,A
626 Physics of Fiber Structures (3) Morphology of polymeric structures; thermal and processing history on mechanical, electrical and chemical properties of fibers. Prereq: 522, Physics 231 and Mathematics 231 or equivalent. F,A
641 Social and Psychological Theories of Apparel Consumption (3) Theories and concepts from social science, fashion, consumer behavior in relation to apparel. Prereq: 540 and 6 hrs of sociology and/or psychology, or consent of instructor. Sp,A
651 The Consumer and Public Policy (3) Economic, social, legal and political framework for policy decisions; economic evaluation of policies that affect consumer behavior. Prereq: 550 or 562, or consent of instructor. Sp
685 Integrative Design: Development and Marketing (3) Systems-oriented approach to strategies involved in product development; methods for identifying critical factors central to decision making and techniques for synthesizing information. Prereq: 24 hrs graduate coursework. F
695 Advanced Topics in Textiles and Apparel (3) Lecture, group discussion, individual research on advanced topics and research areas of current significance. Prereq: 9 hrs textiles/apparel graduate coursework. May be repeated. Maximum 9 hrs.

DEGREE
MAJOR

The Graduate Record Examination is required of all applicants as well as a written comprehensive exam, usually administered in the second year of residence. All M.F.A. applicants must submit three letters of recommendation. 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.

For detailed information about the graduate program, contact the Director of Graduate Studies, Department of Theatre.

MASTER OF FINE ARTS PROGRAM
At least 60 semester hours, 40 of which must be at the 500 level or above are required for the degree of Master of Fine Arts with a major in Theatre, which is normally to be completed in three consecutive years of full-time residence. Theatre 501 is required the first semester of residence. Also required are Theatre 401, 310-11, and at least 3 hours in advanced theatre history and dramatic theory or criticism, including at least one course from each of the two areas.

In addition to the core requirements listed above, each area of concentration has specific requirements:

Design/Technical Production
Required courses are at least 12 hours of 580 Design and Technical Production Seminar, and at least 3 hours in the projects courses. Theatre 401 Principles of Design is
required the first year of residence. Theatre 430 Play Directing is required of scene design students lacking an appropriate undergraduate foundation in directing.

**Acting**

Theatre 520-21-22-23-24-25 Master Class and required, along with one course in directing and two hours each in voice and dance.

**Directing**

Required are 430 Directing, 520-21-22-23-24-25 Master Class, and 3 hours of 536 Projects.

**Playwriting**

Required are 470-71 Playwriting, at least 12 hours of 573 Playwriting Seminar, and at least 3 hours of 585 Production Workshops.

**Dramaturgy**

An additional two courses in dramatic theory and criticism are required as are Theatre 570 Dramaturgy, and Practice, at least 6 hours of 585 Production Workshops, 430 Play Directing, 3 hours of 536 Projects in Directing, and 12 hours of 573 Seminar and Projects. In addition, students must select an arts and humanities specialization comprising at least one year of language study plus 6 hours in the selected area.

Students in the MFA program are evaluated annually by joint professional faculty and MFA program. Satisfaction of the examination of the comprehensive examination is prerequisite to entry into the third year. Thesis and oral defense (Theatre 500, 6 hours minimum) must be completed satisfactorily before the degree is conferred.

**Requirements for Second Master's Degree**

Students admitted to the MFA program who have already earned a Master's or a doctoral degree in any area of drama, play directing, and practice, and have earned at least 12 credit hours from the previous graduate program to the MFA degree with approval of the student's department, 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.

401 Principles of Theatrical Design (3) Fundamental principles of design; visual and structural relationships. Projects assigned to develop understanding and perception. Prereq: 100.

409 Stage Make-up (2) Problems in make-up design and application, character analysis, physiognomy and chiaroscuro. Prereq: 100.

410 Dramatic Theory and Criticism (3) Theatre aesthetics from Aristotle to present.


425 Advanced Phonetics (3) Phonetic aspects of contemporary dialects of English language. Prereq: Consent of instructor.

430 Principles of Play Directing (4) Problems in composition, picturization, rhythm, movement. Prereq: 220, 221, and consent of instructor.


445 Advanced Costume Construction (3) Advanced studies in construction technique, tailoring, vacuum forming, plastics in design, and cobbling. Prereq: 345 or consent of instructor.

446 Costume Patternmaking (3) Draping patterns for period costumes. Coserity and study of historic patterns 1500-1900. Prereq: 345 or consent of instructor.

450 Advanced Scenery Technology I (3) Study and practice of theatre woodworking; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

451 Advanced Scenery Technology II (3) Study and practice of metalworking and plastics for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

452 Advanced Scenery Technology III (3) Study and practice of stage rigging for theatrical productions; production participation required. Prereq: 250. Graduate credit to theatre M.F.A. students only.

454 Scenery Painting (2) Introduction to materials, techniques, and principles of craft. Gaining skills and understanding through studio experience. Prereq: Consent of instructor.


461 Special Effects in Lighting and Sound (4) Projects in special effects, creative application of technology. Problem solving, drafting, and execution of effects for production. Production participation required. Prereq: 260 or consent of instructor.

462 Advanced Lighting Design (3) Advanced problems in lighting design and theory. Lighting musical theatre, opera, and dance. Prereq: 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 Introduction to Lighting Design for Non-Designers (3) Theory and practice of stage lighting design, relationship between designers and non-design practitioners: directors, actors, choreographers, architects. Not open for specialization in lighting design.

470-71 Playwriting (3,3) Advanced instruction in writing of plays. Prereq: Consent of instructor.

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

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


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

501 Introduction to Graduate Research in Theatre (3) Research tools and methods for theatre artist and scholar.

502 Registration for Use of Facilities (3-15) Required for the student not otherwise registered during any semester when he 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 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 Class in acting techniques, voice, and movement. Theatre MFA students only.

536 Projects in Play Directing (3) Practical work in play direction involving various lengths and kinds of scripts. May be repeated. Maximum 9 hrs.

539 Play Production in the Secondary Schools (3) Principles and methods for directing high school dramatic programs.

542 The Social History of Costume (3) Study and analysis of costume as related to society's manners and mores, architecture and furniture.


545 Millinery for the Stage (2) Pattern making and construction techniques for hats from antiquity to present. Prereq: Consent of instructor.

546 Advanced Costume Patternmaking (3) Advanced studies in patterning period costume. Development of historic patterns through flat pattern method. Prereq: 446.

549 Projects in Costume Technology (1-3) Individualized studies in costume technology in theatre production. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.


553 Projects in Scenic Design (1-3) Conception and completion of major projects, both theoretical and actual, in scene design. May be repeated. Maximum 9 hrs.

554 Studies in Scenic Design (3) Advanced scene design techniques and approaches to design for complex dramas and varied dramatic forms. May be repeated. Maximum 6 hrs.

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: Consent of instructor. May be repeated. Maximum 9 hrs.

570 Dramaturgy: Theory and Practice (3) Methods and materials. Prereq: Consent of instructor.

571 Seminar & Projects in Dramaturgy (3) Directed study and experience. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

573 Seminar in Playwriting (3) Exercises and projects tailored for advanced students in playwriting. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

575-76 Studies in Dramatic Theory and Criticism (3,3) Broad-based study of major ideas about drama.

580 Design and Technical Production Seminar (1-6) Selected aspects of scene design and technical production. Prereq: Consent of instructor. May be repeated. Maximum 18 hrs.

585 Production Workshops (1-6) Directed experience in production collaborations. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.


599 Project and Thesis (1-6) Available to theatre MFA students only. Prereq: Minimum of 30 hrs toward MFA degree and consent of advisor. May be repeated. Maximum 18 hrs.
Transportation
See Marketing, Logistics and Transportation

Urban Practice
(College of Veterinary Medicine)

MAJOR DEGREE
Veterinary Medicine .............................................. D.V.M.

D. J. Krahwinek, Head

Professors:

Associate Professors:

Residents:

See Veterinary Medicine for program description.

PROFESSIONAL COURSES

881 Clinical Rotations in Urban Practice I (4) Clinical training in medicine, surgery and specialty disciplines for companion animals. Direct responsibility for diagnosis, patient 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, patient 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, patient 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, patient 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 (1-8) Extra- mural and specially designed study for students interested in select topics in medicine, surgery, anesthesiology, radiology and medical specialties of small companion animals.

890 Graduation...
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>533</td>
<td>Epidemiology/Public Health (4)</td>
<td>Principles of epidemiology and public health.</td>
</tr>
<tr>
<td>536</td>
<td>Toxicology (2)</td>
<td>Principles of toxicology: molecular mechanisms, pathologic processes and clinical features of animal diseases caused by common toxic agents.</td>
</tr>
<tr>
<td>537</td>
<td>Multispecies Medicine (4)</td>
<td>Anatomy, pathophysiology, medicine and surgery of birds, reptiles and laboratory animals of zoo mammals. Common species and diseases.</td>
</tr>
<tr>
<td>545</td>
<td>Principles of Medical Science (2)</td>
<td>Physiologic and pathologic principles underlying mechanisms of disease. Selected examples of human and animal diseases; recent scientific advances in biomedical sciences.</td>
</tr>
<tr>
<td>549</td>
<td>General Electives in Clinic (2)</td>
<td>Special rotation with clinical training in urban practice, rural practice, environmental practice and pathobiology.</td>
</tr>
<tr>
<td>550</td>
<td>Introduction to Clinic (2)</td>
<td>Clinical veterinary practice with discussions and practical experiences. Problem-oriented veterinary medical record.</td>
</tr>
<tr>
<td>552</td>
<td>Cardiovascular System (3)</td>
<td>Pathophysiology, special pathology, medicine and surgery of cardiovascular systems of all species of animals. Anatomic, physiologic and pharmacologic principles which provide basis for treatment.</td>
</tr>
<tr>
<td>553</td>
<td>Endocrine System (2)</td>
<td>Pathophysiology, medicine and surgery of endocrine system of all species of animals. Mechanisms of endocrine and metabolic diseases: therapy and prevention.</td>
</tr>
<tr>
<td>554</td>
<td>Respiratory System (3)</td>
<td>Pathophysiology, special pathology, medicine and surgery of respiratory system of all species of animals. Upper and lower respiratory system: infections and noninfectious diseases.</td>
</tr>
<tr>
<td>555</td>
<td>Radiology (3)</td>
<td>Basic, advanced and special techniques in radiology with interpretation and use of radiologic and related techniques in diagnosis and treatment of diseases of all species.</td>
</tr>
<tr>
<td>556</td>
<td>Special Senses (2)</td>
<td>Pathophysiology, special pathology, medicine and surgery of visual and auditory systems of all species of animals.</td>
</tr>
<tr>
<td>557</td>
<td>Nervous System (3)</td>
<td>Pathophysiology, special pathology, medicine and surgery of nervous system of all species of animals: clinical neurology and neuropathology.</td>
</tr>
<tr>
<td>558</td>
<td>Clinical Rotation in Specialties (2)</td>
<td>Clinical training in specialty services: anesthesia, ophthalmology or radiology. Direct responsibility for diagnosis, patient care, and treatment of clinical cases in both urban and rural practice.</td>
</tr>
<tr>
<td>559</td>
<td>Clinical Clerkship (2)</td>
<td>Advanced clinical training in urban practice, rural practice, environmental practice, and pathobiology.</td>
</tr>
</tbody>
</table>

### GRADUATE COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>403</td>
<td>General Genetics Laboratory (2)</td>
<td>Experiments designed to illustrate basic principles of inheritance. Primary organism—Drosophila. Prereq: Biology 220. 2 labs.</td>
</tr>
<tr>
<td>404</td>
<td>Cytological Technique (2)</td>
<td>Practical experience with variety of techniques: microscopy, embedding and sectioning, chromosome preparations, autoradiography, in situ hybridization, histochemistry, and immunofluorescence. Prereq: Biology 210. 2 labs.</td>
</tr>
<tr>
<td>405-06</td>
<td>Minilab in Zoology (1,1)</td>
<td>Select advanced topics in zoology, either in a subject matter Consult departmental listing for topics offered. Prereq: As announced. May be repeated. Maximum 3 hrs. May apply to multiple courses.</td>
</tr>
<tr>
<td>410</td>
<td>Advanced Cell Biology (3)</td>
<td>Molecular and supramolecular structure and functions of eukaryotic cells: regulatory mechanisms, physiology, behavior and cellular interactions. Prereq: Biology 210, 220. 2 hrs and 1 lab.</td>
</tr>
</tbody>
</table>
415 Parasitology (3) Parasitic relationships: physiological, ecological, evolutionary and economic aspects. Prereq: Biology 230 or consent of instructor. 2 hrs and 1 lab.

420 Cell and Tissue Structure and Function (4) Study of animal cells and tissues at light and electron microscopic levels. Prereq: Biology 210. 2 hrs and 2 labs.

430 Immunology (2) (Same as Microbiology 430.) Scope levels. Prereq: Biology 210. 2 hrs and 2 labs.

435 Comparative Animal Physiology (3) Comparison of diverse physiological mechanisms aiding in adaptation to particular habitats and lifestyles. Prereq: Biology 210, 230, 2 yrs of chemistry. Recommended prereq: Physiology.

445 Comparative Animal Physiology Laboratory (4) Laboratory in physiology. Prereq or coreq: Biology 210, 230, 2 yrs of chemistry. Recommended prereq: Physiology.

449 Laboratory in Physiology (2) Prereq or coreq: Biology 210, 230, 2 yrs of chemistry. Recommended prereq: Physiology.


455 Comparative Animal Behavior Laboratory (3) Introduction to observational and experimental research in ethology. Coreq: Coreq. (Same as Psychology 455.)

460 Evolution (3) Modern concepts of animal evolution. Prereq: Biology 220.

463 Human Genetics (3) Genetic and molecular principles and problems of human inheritance. Prereq: Biology 220.

470 Aquatic Ecology (3) Introduction to physiological and ecological aspects of plants and animals in nature. Prereq: Consent of instructor. Maximum 12 hrs.

472 Arachnology (3) Study of spiders, mites, scorpions and relatives. Prereq: 2 hrs and 1 lab.

473 Herpetology (3) Biology of amphibians and reptiles, ecology and adaptation to environment. Prereq: Biology 230. 2 hrs and 1 lab.

474 Ichthyology (3) Evolution, classification, collection and identification, distribution and biology of fishes, freshwater fauna of Eastern North American. Prereq: Biology 230 or consent of instructor. 2 hrs and 1 lab.

475 Ornithology (3) Behavior, ecology, populations, evolution and field identification of birds. Prereq: Biology 230. 2 hrs and 1 lab.

476 Mammalogy (3) Evolution, classification, biogeography, ecology, behavior and functional anatomy of mammals. Prereq: Biology 230 or equivalent. 2 hrs and 1 lab.

480 Physiology of Exercise (3) Functions of body in muscular work: physiological aspects of fatigue, training and adaptation to environment. Prereq: 230 or 240. 2 hrs and 1 lab.

490 Comparative Endocrinology (3) Comparative analysis of physiology and morphology of endocrine glands in vertebrates and invertebrates, their role and interaction in maintenance of organism and species. Prereq: 440 or equivalent.

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

501 Graduate Research Participation (3) Advanced research techniques studied under supervision of staff research director. Open to all graduate students in good standing. Prereq: Consent of department and research director. S/NC only.

502 Registration for Use of Facilities (3-15) Required for the use of the facilities during the first and second year of graduate study. May be repeated. S/NC only. E

503 Zoology Seminar (1) Advanced topics in zoology. Senior zoology majors encouraged. Required of all first- and second-year graduate students. May be repeated. Maximum 6 hrs. S/NC 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/NC only.

506 Research Methods (1-3) Instruction in methods and techniques of research. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 9 hrs.

507 Animal Cell Culture (2) Techniques for culture of animal cells, tissues and organs. 1 hr and 1 lab.

508 Methods of Taxonomy (2) Speciation, taxonomic decisions, approaches to systematic and rules of nomenclature. Prereq: Consent of instructor.

513 Advanced Developmental Biology (3) Molecular and genetic aspects of differentiation and morphogenesis; current literature. Recommended prereq: Life Sciences 511-12.

516 Colloquium in Ethology (1) (Same as Psychology 516.)

520 Advanced Mammalian Physiology (3) Cellular and organ systems physiology. Prereq: Undergraduate general anatomy and physiology and Biochemistry 410 or equivalent or consent of instructor.

521 Experimental Physiology (2) Laboratory principles and techniques in modern physiology; principles of physiological recording. Prereq: 2 hrs of instructor. 2 labs.

522 Advanced Muscle Physiology (3) Cellular and molecular aspects of muscle contraction and nerve control of contraction, and their relationship to locomotor adaptations in whole animal. Prereq: 440 or 445.

523 Physiology of Hormones (3) Cellular and organismal 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: 230. 3 hrs lab and field study.

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

560 Biometry (3) Statistical methods in analysis of quantitative biological data. Prereq: Statistics course or consent of instructor.

573 Population Biology (3) Genetics and ecology of natural populations of plants and animals and aspects of behavior in determining population structure. Prereq: Introductory courses in ecology and genetics. (Same as Botany 573 and Ecology 573.)

583 Zoogeography (3) Processes determining geographic distribution of animals and distribution and composition of animal communities. Prereq: Ecology course or consent of instructor.

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

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

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

600 Doctoral Research and Dissertation (2-15) 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.