The Institute of Agriculture traces its history to 1869 when the University was designated as Tennessee's Federal Land-Grant Institution. Under terms of the Federal Land-Grant Act, the University was enabled to offer instruction in agriculture and the mechanic arts for the first time. Since 1869, agricultural programs at the University have been expanded to include research for the development of new knowledge and extension for dissemination of such knowledge to rural people. Thus the Institute of Agriculture has come to include the work of three main divisions: Agricultural Experiment Station, Agricultural Extension Service, and College of Agriculture.

In 1974 the College of Veterinary Medicine was established within the Institute. The college is developing research and graduate programs in veterinary medical sciences in addition to the professional curriculum leading to the deg,-be, Doctor of Veterinary Medicine.

**Agricultural Experiment Station**

D. M. Gossett, Dean  
T. J. Whatley, Associate Dean  
J. I. Sewell, Assistant Dean

The Agricultural Experiment Station was established by the University's Board of Trustees on June 8, 1882, five years before the passage of the Hatch Experiment Station Act by the U.S. Congress. The University was one of the first five institutions in the U.S. to establish an Agricultural Experiment Station. Since its beginning the Station has given first attention to investigations of concern to the agriculture of Tennessee. The investigations of the Station follow a systematic method of gaining and applying knowledge efficiently to the biological, physical, and economic phases of producing, processing, and distributing farm and forest products; to the social and economic aspects of rural living; and to consumer health and nutrition. Both farm and urban populations gain from the accomplishments of the Agricultural Experiment Station. Examples of some of these accomplishments are new and improved varieties of crops, new and better methods of controlling crop and livestock pests, more efficient production of crops and pasture through improved fertilization and mechanization, and more efficient feeding and management of livestock.

The program is designed and administered through sixteen subject matter departments located at Knoxville. A number of the staff have teaching responsibilities in addition to their research. To assist in the research program the Station supports a large number of graduate students. To serve Tennessee's diverse agriculture, branch stations are operated at Jackson, Milan, Grand Junction, Spring Hill, Springfield, Lewishburg, Crossville, Greeneville, Martin and a forestry branch station at Oak Ridge. Professional and technical staff are in residence at these locations.

**Agricultural Extension Service**

M. L. Downen, Dean  
T. W. Hinton, Associate Dean  
M. P. Clarke, Assistant Dean  
B. G. Hicks, Assistant Dean

The Agricultural Extension Service was established in 1914. Its purpose is to extend through various educational means agricultural and home economics information to farm families and others in the state who do not have the opportunity to enroll in resident courses of instruction at colleges.

The educational program is carried on through offices in each of the ninety-five counties of the state. Educational emphasis includes work in four major program areas: agriculture and natural resources, community resource development, home economics, and education of young people through 4-H Clubs. Extension staff members working directly with local people are supported in the various information fields by a specialist staff, members of which are stationed either in Knoxville, Nashville, or Jackson.

The Agricultural Extension Service operates administratively as one of four units of the Institute of Agriculture. For administration the state is divided into five districts with supervisors located in their respective districts. District headquarters are maintained in Knoxville, Chattanooga, Cookeville, Greeneville, Nashville, and Jackson.

The Agricultural Extension Service operates as a three-way partnership among county, state, and federal governments. The University of Tennessee represents state and federal government and a County Agricultural Extension Committee represents county government in this partnership.

**College of Agriculture**

O. Glen Hall, Dean

Graduate programs of the College of Agriculture are designed to prepare men and women for positions of leadership in industry, state and federal government, teaching, research, and extension. The graduate student is expected to demonstrate a thorough knowledge of the subject matter in his/her specialized field of study and its relationship to the sociological, economic, and environmental impact on society. The student must demonstrate the ability to plan, conduct, analyze, and report original research. More importantly, emphasis is given to intellectual growth and to the development of scholarly habits of study, reasoning and analysis to the end that the graduate will continue to grow and develop professionally throughout his/her career.

**MASTER OF SCIENCE PROGRAMS**

Programs of graduate study leading to the Master of Science degree are offered through all departments in the College of Agriculture. The general rules of The Graduate School apply to all graduate work in the college. The graduate program may be entirely in one major subject or may include subject matter areas related to the major.

Both majors and minors are available in Agricultural Economics, Agricultural Engineering, Agricultural Extension, and Agricultural Mechanization.
Entomology and Plant Pathology, Food Technology and Science, Ornamental Horticulture and Landscape Design, and Plant and Soil Science. Majors only are available in Forestry and Wildlife and Fisheries Science, and from the Department of General Agriculture and Rural Sociology. The minor in General Agriculture requires 18 hours of course work. A complete listing of majors is shown on pages 8-9.

For admission to a graduate degree program, the student must have a satisfactory academic average and have completed the substantial requirements for an undergraduate major in his/her field of study or have completed sufficient undergraduate work in related areas to satisfy the department that he/she can successfully pursue graduate study in the chosen field. Prerequisite courses may be required when the student's preparation is deemed to be inadequate.

Each program of course work and thesis research is planned by the student and will depend upon the student's background, interests, and professional objectives. For example, a student majoring in Entomology and Plant Pathology may pursue work with an emphasis either in the area of plant pathology or economic entomology. Normally, graduate programs will include the thesis requirement. There is, however, a non-thesis option in the Department of Agricultural Economics and Rural Sociology and the Department of Forestry, Wildlife and Fisheries. The non-thesis option with a major in Agricultural Economics has the following minimum requirements: 48 hours of course work of which at least 10 be at the 5000-level; 18 hours in agricultural economics; 9 hours of economic theory; 6 hours in quantitative methods in agricultural economics, statistics, or mathematical economics; final comprehensive written and oral examination.

Requirements of the non-thesis option for the Master of Science degree in major in Forestry are as follows:
1. 50 hours of course work of which 25 must be at the 5000 level or above.
2. An advisory committee of not less than 3 faculty members will be selected. At least one member in addition to the major professor will be from the Department of Forestry, Wildlife and Fisheries. The committee will meet and schedule the student's program during the first quarter in residence.
3. Forestry 5011 (3).
4. 12 hours of course work in the Department of Forestry, Wildlife and Fisheries at the 5000 level or above, exclusive of Forestry 5011.
5. Final comprehensive written and oral examination.

DOCTORAL PROGRAMS
Graduate study programs leading to the Doctor of Philosophy degree in Animal Science, Agricultural Economics, Agricultural Engineering, Food Technology and Science, and Plant and Soil Science are offered in the college. General Graduate School requirements relative to admission, faculty advisory committees, residence, grades, research, and admission to candidacy for degree apply to all doctoral programs. Special departmental requirements are listed in the following paragraphs.

Agricultural Economics and Rural Sociology
Subject Area Requirements: All candidates pursuing the Doctor of Philosophy degree will be required to demonstrate competence in examinations in the following areas:
A. A major area of concentration to be selected from the following:
1. Agricultural policy
2. Agricultural marketing and price analysis
3. Farm management and production economics
4. Natural resource economics
5. Rural development
B. The core areas:
1. Agricultural economics
2. Economic theory
3. Mathematical and quantitative methods in agricultural economics

Course Requirements: A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for Master's research, is required in the doctoral program. Of this total, 36 hours in doctoral research and dissertation are required. At least 30 hours of course work shall be in agricultural economics and 15 hours in economics. Excluding the dissertation, a minimum of 21 hours in agricultural economics and 36 hours in agricultural economics and economics combined must be in courses numbered 5000 and above.

Agricultural Engineering
Candidates pursuing the Doctor of Philosophy degree in Agricultural Engineering may specialize in one of the following areas:
1. Agricultural power and machinery
2. Soil and water conservation engineering
3. Agricultural structures
4. Electric power and processing
Supporting studies are required in related biological, physical, and engineering sciences and mathematics fundamental to the training of the candidate.

Additional course requirements for the degree are:
1. Minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of the credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 6000 Doctoral Research and Dissertation.
2. A minimum of 30 quarter hours credit will be in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. The program of each candidate shall consist of a major and supporting studies in one or more additional areas. The major shall consist of a minimum of 24 quarter hours exclusive of dissertation. A minimum of 24 quarter hours shall be taken in departments outside of the Department of Agricultural Engineering.
4. The specific program of a candidate shall be planned with the major professor in consultation with a faculty advisory committee in planning his/her program. The major professor will serve as chairperson of the faculty advisory committee and will direct the research and preparation of the dissertation.

Animal Science
The Department of Animal Science offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:
1. Animal nutrition
2. Animal breeding
3. Animal physiology
Supporting studies are required in related biological and physical sciences fundamental to the training of the candidate.

Additional specific course requirements for the degree of Doctor of Philosophy in Animal Science include:
1. Minimum of 108 quarter hours credit in courses beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 6000 Doctoral Research and Dissertation.
2. At least 36 quarter hours credit in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. A minimum of 24 quarter hours credit must be completed in related fields outside of animal science.

The specific program of a candidate for the degree of Doctor of Philosophy in Animal Science depends upon the interest and previous training of the candidate. Actual course content of the program is planned with each student in consultation with a faculty advisory committee to meet requirements in the various areas of concentration.

Food Technology and Science
The Department of Food Technology and Science offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:
1. Food products
2. Food chemistry
3. Food microbiology
Supporting studies will be required to provide fundamental training in sciences related to the student's specialized area. Various commodity interests can be emphasized in all three areas by judicious selection of courses and dissertation topics.

Additional specific course requirements for the Doctor of Philosophy degree in Food Technology and Science include:
1. A minimum of 106 quarter hours credit beyond the bachelor's degree exclusive of the Master's thesis. Of this number, students will be required to complete 36 quarter hours in 6000 Doctoral Research and Dissertation.
2. At least 36 quarter hours credit in courses at the 5000 and 6000 level, exclusive of Doctoral Research and Dissertation.
3. A minimum of 9 hours of courses for graduate credit outside of the Department of Food Technology and Science.

The specific program of a candidate for the degree of Doctor of Philosophy in Food Technology and Science depends upon the interest and previous training of the candidate. Actual course content of the program is planned with each student in consultation with a faculty advisory committee to meet requirements for the degree and area of concentration.

Plant and Soil Science
The Department of Plant and Soil Science
offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:
1. Soils
2. Plant breeding and genetics
3. Crop physiology
Supporting studies are required in related sciences fundamental to the training of the candidate.
Some of the specific requirements for the degree are:
1. Minimum of 108 quarter hours credit beyond the Bachelor's degree exclusive of Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in Doctoral Research and Dissertation.
2. Minimum of 30 quarter hours credit in courses numbered 5000 and 6000 exclusive of Doctoral Research and Dissertation.

The specific program of a candidate for the degree of Doctor of Philosophy in Plant and Soil Science will depend upon the interest and previous training of the candidate. The program of courses and research will be planned with the student in consultation with a faculty advisory committee. The major professor will serve as chairperson of the faculty advisory committee and will direct the research and the preparation of the dissertation.

Departments of Instruction

Agricultural Economics and Rural Sociology

MAJOR DEGREES
Agricultural Economics

M.S., Ph.D.

Professors:
J. A. Martin (Head), Ph.D. Minnesota; M. B. Badenhop, Ph.D. Purdue; J. R. Brooker, Ph.D. Florida; D. W. Brown, Ph.D. Iowa State; C. L. Cleland, Ph.D. Wisconsin; I. Dubov, Ph.D. California (Berkeley); L. H. Kaller, Ph.D. Kentucky; T. H. Klinefelter, Ph.D. Kentucky; F. O. Leuthold, Ph.D. Wisconsin; B. R. McManus, Ph.D. Purdue; D. B. Sappington, Ph.D. Illinois.

Associate Professors:

Assistant Professors:
W. M. Park, Ph.D. Virginia Polytechnic Institute; G. D. Whitple, Ph.D. Washington State.

The Department has programs for the Doctor of Philosophy degree and the Master of Science degree with a thesis or non-thesis option.

Agricultural Economics

4240 World Agriculture and Trade (3) Economic bases of world agricultural production and trade; resource location, land tenure systems, international trade and commercial policy. Prereq: Agriculture 1110 and Economics 2120, or consent of instructor. F

4250 Agricultural and Rural Planning (3) Decision-making concepts applied to design and implementation of data action programs. Case examples from the U.S. and other countries. Prereq: Agriculture 1110 and Economics 2120, or consent of instructor. Sp

4310 Agricultural Finance (3) Nature and source of credit; problem of farmers; kinds and sources of farm credit. Agricultural insurance and taxation. Prereq: Agriculture 1110 and Economics 2120, Sp

4320 Agricultural Policies (3) Meaning of agricultural policy in democratic society; relationship of government groups to public policy; problems giving rise to policy; agricultural policy and appraisal of results; policy problems. Prereq: Agriculture 1110 and Economics 2120, Sp

4330 Land Economics (3) Problems and policies of land use, conservation, development, taxation; tenure; population growth and demand for land; principles and theories of rent, property, value, and income. Prereq: Agriculture 1110 and Economics 2120, F

4610 Management of Farm Supply and Marketing Firms (3) Operation of firms selling farm supplies and merchandising agricultural products. Emphasis on accounting, management and economic theories for decision making. Prereq: Agriculture 1110 and Economics 2120, F


5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5011 Special Problems in Lieu of Thesis (3) E

5120 Agricultural Price Analysis (3) Analysis and interpretation of factors affecting agricultural prices; price trends and cycles; application of economic theory and statistics. Prereq: 3420. Prereq: Consent of instructor. W

5130 Advanced Agricultural Production Econometrics (3) Theory and empirical concepts of agricultural resource allocation problems under conditions of uncertainty. Prereq: 4140 or equivalent. Sp

5210 Seminar: Agricultural Policies (3) Sp

5220 Seminar: Methodology of Research (3) W

5230 Seminar: Adjustments to Industrialization (3) F

5310 Research (3) Special research problems in agricultural economics and rural sociology. Gathering, tabulating and interpreting data and report writing. May be repeated. Maximum 9 hrs. S/NC only. E

5410 Agricultural Marketing Analysis (3) Application of tools of economic analysis and measurement to problems at all levels of marketing system for agricultural commodities. Prereq: 4630 or equivalent. Sp

5420 Advanced Land Economics (3) Problems in land tenure, land use, and conservation in United States and selected foreign countries. Prereq: 4330 or equivalent. F

5440 The Economics of Agricultural Development (3) Role of agriculture in overall economic development; economic nature of traditional agricultural
ture, and analysis of causal forces and structural interdependence of agricultural development under conditions of economic change. Prereq: 4240 or consent of instructor. W

5610 Quantitative Methods in Agricultural Economics (3) Analytical techniques useful in estimation of functions—supply, demand and production—and prediction of economic variables. Emphasis on application of linear programming; model specification, estimation technique using computer and interpretation of results. Prereq: Statistics 4310 or Economics 5510 or consent of instructor. W

5710 Quantitative Methods in Agricultural Economics (3) Linear programming technique with empirical applications, made to problems of maximizing profit, minimizing cost, firm growth, transportation, and location. Input-output analysis, recursive programming, game theory, and nonlinear programming. Prereq: Economics 4180 or consent of instructor. Sp

6000 Doctoral Research and Dissertation (3-15) E

6120-30 Seminars in Agricultural Economics (3,3) Topics selected from the areas of economics of production, consumption or distribution in agriculture and related industries and public policies concerned with agriculture and related industries. F, Sp

6210 Agricultural and Rural Transformation Problems (3) Systematic evaluation of policy and development proposals related to agricultural modernization, food supply, and rural living. Decision-making processes and social analysis. Analysis of current issues in U.S. and developing nations. Prereq: Consent of instructor. Sp

6410 Agricultural Supply Analysis (3) Estimating agricultural supply relationships using aggregate time series regression, production functions, linear programming, simulation and farm growth models with emphasis on correspondence between theoretical concepts and model attributes. Prereq: 5130 or consent of instructor. F

6420 Marketing and Resource Use (3) Institutional settings for research and policy formulation. Analytical tools to measure efficiencies of marketing and resource use. Emerging problems in marketing and resource use. Wastes management in marketing systems to conserve resources and environment. Prereq: 5410 or consent of instructor. W

Rural Sociology

3420 Rural Sociology (3) Nature of rural society; social system concepts; rural-urban differences; nature of social relations; population characteristics and movement; problems of rural people; tenancy, land tenure, and analysis of social relations; population characteristics and movement; problems of rural people; tenancy, land tenure, and analysis of social relations. Prereq: 5410 or consent of instructor. Sp

4450 Diffusion of Agricultural Technology (3) Analysis of diffusion process whereby new technology spreads from scientists to final adopters. Adoption process, communication behavior, mass media, role of professional change agents, opinion leadership, and two-step flow hypothesis. Prereq: 3420 or consent of instructor. Sp

5340 Special Problems (3) Special topics in rural sociology. Prereq: 3420 or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

5430 Seminar in Rural Sociology (3) Current rural sociological literature and research; relevance of general sociological theory and methodological techniques. Prereq: 3420 or equivalent. F

5450 Advanced Rural Sociology (3) Application of sociological concepts to analyzing changing structure and function of rural life; rural social values, attitudes, and norms as they influence the family, formal and informal groups, population shifts and changing farm technology. Prereq: 3420 or equivalent. W

5470 Research Problems in Rural Communities (3) Special problems related to research in rural areas. Sampling procedures, questionnaire construction, interviewer selection, testing, control, and legitimization needs. Prereq: 4450 or consent of instructor. W

6450 Sociology of the Family (3) Analysis of the family, its role in social system in families, kinship, socialization, and movement.
Agricultural Engineering

MAJORS

Agricultural Engineering
Agricultural Mechanization

DEGREES

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

Professors:
D. H. Luttrell (Head), Ph.D. Iowa State;
L. B. Bledsoe, Ph.D. Oklahoma State, P.E.;
J. J. McDow, Ph.D. Michigan State, P.E.;
J. L. Serum, Ph.D. North Carolina State, P.E.;
C. H. Shelton, M.S. Virginia Polytechnic Institute.

Associate Professors:
F. D. Tompkins, Ph.D. Tennessee, P.E.;
L. R. Wilhelm, Ph.D. Tennessee, P.E.; L. M. Safely, Jr., Ph.D. Cornell.

Assistant Professor:
D. O. Baxter, M.S. Missouri.

Agricultural Engineering

4230 Selected Topics in Agricultural Engineering (3) Develop new topics as required by current trends and problems in agricultural engineering.


4620 Design of Structures for Production, Process, and Environmental Control (3) Functional planning and design of structures for agricultural buildings; emphasis on complete design of structures or system, functional, structural, and environmental aspects. Prereq: 3620. 1 hr and 2 labs. Sp

4630 Design of Processing and Materials Handling Systems (3) Development of systems and components for integrated agricultural processing considering mass and energy balances, product characteristics, equipment specifications, storage, handling and economic merit. Prereq: 3630. 1 hr and 2 labs. F

4640 Design of Agricultural Machinery (3) Functional requirements of agricultural machinery. Elements of machine component design; synthesis of mechanisms; mechanical and hydraulic drives. Team effort in completing machine design project. Prereq: 3640 or consent of instructor. 1 hr and 2 labs. Sp

5000 Thesis (1-15) E

5240 Environmental Control in Agricultural Structures (3) Engineering analysis of factors related to processes of animal and plant life; basis for development and design of facilities and structures for confined housing of animals, controlled environment for plant growth, and storage facilities for plant and animal products. Prereq: Agricultural Mechanization 3220, Mechanical Engineering 3110 or consent of instructor. 2 hrs and 1 lab. Sp

5340 Hydrology of Agricultural and Forest Lands (3) Analytical approach to problems involving water surplus, deficiency and time distribution as related to agricultural and forest purposes. Prereq: 3610, introductory hydrology, Forestry 4020, or consent of instructor. 2 hrs and 1 lab. F

5440 Instrumentation in Agricultural Systems (3) Analysis of specific instrumentation needs in agricultural industry and research problems; principles and design in utilization of specialized instrumentation. Prereq: Engineering electronics or consent of instructor. 2 hrs and 1 lab. Sp

5540 Engineering Properties of Agricultural Materials and Products (3) Fundamental engineering properties of agricultural products and materials related to handling, processing, and utilization. Prereq: Processing and materials handling systems and Engineering Science and Mechanics 3311. 2 hrs and 1 lab. Sp A

5640 Research Problems in Agricultural Engineering (3) Theoretical and experimental studies relating to current problems in agricultural engineering. May be repeated. Maximum 9 hrs.

5710-20 Similitude in Design and Research (3, 3) Dimensional analysis in development of models: theory and types of models, prediction equations; interpretation of data: applications to machinery, soil and water structures, agricultural buildings, and other agricultural engineering-related problems. Prereq: Engineering Science and Mechanics 3130 and 3311. 2 hrs and 1 lab. F, W, A

6000 Doctoral Research and Dissertation (3-15) E

6110 Seminar (1) Current research and literature related to engineering in agriculture. May be repeated. Maximum 3 hrs.

6310 Engineering Systems Analysis in Agriculture (3) Systems approach to design of engineering experiments and applications to include linear programs, computerized mathematical evaluations, and feedback control in agricultural problems. Prereq: Mathematics 4550 or 4710. Coreq: 3710 or equivalent. 2 hrs and 1 lab. F

6510 Selected Topics in Agricultural Engineering (3) Lecture, group discussion, and individual study on specialized developments in power and machinery, soil and water structures, and processing. May be repeated. Maximum 9 hrs.

Agricultural Mechanization

4160 Agricultural Waste Utilization and Disposal (3) Techniques, equipment, and structures for utilizing, treating, and disposing of agricultural wastes by land spreading, lagging, and processing. 2 hrs and 1 lab. F

4170 Small Engines (3) Concepts and mechanics of small gasoline engines; selection, operation, adjustment, and repair of single cylinder engines. 2 hrs and 1 lab. W

4180 Equipment and Techniques for Application of Agricultural Chemicals (3) Equipment for application of liquid, solid, and gaseous chemicals; system components; operational characteristics; safety considerations; calibration; selection and management; materials handling and disposal methods. 2 hrs and 1 lab. Sp

4210 Agricultural Machinery and Tractors (4) Agricultural machinery and power units; adaptation to agricultural practices; field efficiencies, capacities, adjustment and servicing. Prereq: Mathematics 1560. 3 hrs and 1 lab. W

5000 Thesis (1-15) E

5110 Research Problems in Agricultural Mechanization (3) Research problems related to recent developments and current practices in agricultural mechanization. May be repeated. Maximum 9 hrs.

5210 Electromechanical Systems in Agriculture (3) Integration of electric power, mechanical equipment, structures, and environmental systems to plant and animal production, crop processing, and materials handling. Prereq: 3220 and 3510. 2 hrs and 1 lab. F, A

5410 Agricultural Machinery Systems Analysis (3) Analysis of current agricultural machinery; adaptation planning for sequential operations; machinery for unique and alternate production and harvesting systems; operational management. Prereq: 4120. 2 hrs and 1 lab. Sp, A

5510 Selected Topics in Agricultural Mechanization (3) Lecture, group discussion, and individual study on specialized developments in agricultural mechanization. May be repeated. Maximum 9 hrs.

Agricultural Extension Education

MAJOR

DEGREE

Agricultural Extension

M.S.

Professors:
R. L. Dotson (Head), Ph.D. Pennsylvania State;
L. H. Dickson, Ed. D. Cornell.

Associate Professor:
C. E. Carter, Jr., Ph.D. Ohio State.

3110 Introduction to Agricultural Extension (3) History, philosophy, organization: teaching methods, relationships with other educational agencies. Graduate credit for non-majors only.

4110-20 Field Studies (3, 3) Supervised work experience with county extension agents in a designated county. Prereq: 3110 and consent of instructor. Requires living off-campus for a specified time.

5000 Thesis (1-15) E

5100 Special Problems in Agricultural Extension (1-6) May be repeated. Maximum 9 hrs.

5210 Long-range Extension Program Planning (3) Development of county extension program based on effective interpretation of physical, social, economic characteristics of areas. Prereq: 3110 or consent of instructor.

5220 Seminar (3) Review of literature and developments in agricultural extension methods. Prereq: 3110 or consent of instructor.

5230 Evaluation in Programs of Agricultural Extension (3) Principles and procedures in evaluation of educational programs. Emphasis on analysis of place and importance of volunteer leadership function, techniques of effective leadership in small groups and methods of developing volunteer leadership in agricultural extension work. Prereq: 3110 or consent of instructor.

5330 Supervision of Agricultural Extension Programs and Personnel (3) Theories of human effectiveness; principles of successful supervision applied to various parts of county, district and other extension programs; planning for effective office management. Prereq: 5210 or 5220 or consent of instructor.

Animal Science

MAJOR

DEGREE

Animal Science

M.S., Ph.D.

Professors:
D. O. Richardson, (Acting Head), Ph.D. Ohio State;
4230 Applied Rejection in Farm Animals (3) Application of methods and techniques in coordinating, evaluating, processing, and preserving semen; in- semination of cows; dairy based semen collection; technology of artificial insemination; insemination and postpartum. Male and female infertility. Prereq: 3220 1 hr and 2 labs. F, Sp

4330 Feeding Applications for Farm Animals (3) Detailed application of feeding principles designed to allow student to discover and explore feeding op- tions available to producers through problem solv- ing. Prereq: 3330. 1 hr and 2 labs. Sp

4340 Experimental Animal Nutrition Laboratory (2) Laboratory feeding trials to demonstrate basic animal nutrition concepts including preparation and feeding of experimental diets. Prereq: 3330. W

4410 Applied Animal Breeding (3) Principles studied in 3420. Team taught by specialists in breeding of dairy cattle, meat animals, and poultry. Prereq: 3420. 2 hrs and 1 lab.

4610 Beef Cattle Production and Management (4) Principles of nutrition, physiology, and breeding in a complete beef cattle management program. Struc- ture of industry, enterprise establishment, systems of production, production practices and herd im- provement programs. Alternatives in terms of pro- duction response and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, Sp, A

4820 Dairy Cattle Production and Management (4) Principles of nutrition, physiology, and breeding in a complete dairy cattle management program. Struc- ture of industry, enterprise establishment, systems of production, production practices and herd im- provement programs. Alternatives in terms of pro- duction response and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, Sp, A

4830 Pork Production and Management (4) In-tegration of principles of selection, nutrition, breed- ing, physiology and marketing in a complete pork production and management program. Structure of industry, enterprise establishment, systems of pro- duction, production practices and hard improvement programs. Alternatives in terms of production re- sponses and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, Sp, A

4840 Poultry Production and Management (4) Structure of poultry industry, organization and man- agement of the industry. Six week intensive featuring rearing, housing, feeding, processing and marketing. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, Sp, A

4850 Light Horse Production and Management (4) Integration of principles of nutrition, physiology and breeding into light horse management program. Structure of industry, systems and practices of pro- duction; individual animal and herd improvement programs; tack, equipment and commercial producers. Alternatives in terms of pleasure, recreation and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. Sp

4860 Lamb and Wool Production and Manage- ment (4) Integration of principles of nutrition, physiology and breeding into lamb and wool production management program. Structure of industry, enterprise establishment, systems of production responses and economic returns. Prereq: Completion of animal sci- ence sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W, A

5000 Thesis (1-15) E

5110 Problems in Libid of Thesis (1-6) May be re- peated. Maximum 9 hrs. E

5110 Special Problems in Animal Science (1-6) May be repeated. Maximum 9 hrs. E

5210 Endocrine Relations in Animal Production (4) Endocrine glands related to growth and reproduc- tion; hormone preparation for altering growth and repro- duction in farm animals. Prereq: 3210 or con- sent of instructor. 2 hrs and 1 lab. W, A

5230 Advances in Mammalian Reproduction (3) Germ cell development, maturation, transport meta- bolism, and preservation; fertilization and embryonic mortality. Prereq: 3220 or 4230. 2 hrs and 1 lab. W, A

5240 Advanced Studies of the Secretion of Milk (3) Effect of endocrine and nutritional factors on mammary gland development; initiation and mainte- nance of lactation. Prereq: 4210. 2 hrs. and 1 lab. Sp, A

5311 Analytical Techniques in Animal Nutrition (3) Physical and chemical analyses of feeds, ingre- dients and biological fluids associated with nutrition research. 1 hr and 2 labs. F, Su

5322 Advanced Experimental Animal Nutrition (3) Animal experimental techniques for digestion, absorption, nutrient balances and radioisotope tracer- techniques. Prereq: 3311. 1 hr and 2 labs. Sp

5333 Nonruminant Animal Nutrition (4) Physiolo- gical development and changes in digestive system of nonruminant animal during the life cycle. Con- cepts and methodology concerning nutrient require- ments, interrelationships, availability and deficien- cies of nutrients. Nonnutritive additives, toxins, poisonous, and disease effects. Prereq: 3210, 3330 or consent of instruc- tor. 3 hrs and 1 lab. W

5344 Ruminant Animal Nutrition (3) Digestive phys- iology of the ruminant stomach, rumen fermenta- tion, determination and evaluation of feeds, and feed intake regulations of ruminant animals. Prereq: 3330. F

5410 Genetics of Animal Populations (3) Popula- tion and individual, gene and zygotic frequencies; statistical descriptions of populations; forces in- fluencing genetic changes; application to animal breeding. Prereq: 3420 or consent of instructor. 2 hrs and 1 lab. F, A

5510-20 Advanced Animal Physiology (5, 5) Adv- anced animal physiology (primarily mammalian phys- iology); 5510—Membrane neuron, central nervous system, muscles, cardiovascular system, and control mechanisms; 5520—Respiratory, renal, gastrointes- tinal, and reproductive physiology, acid base mechanisms, and metabolism. Should be taken in sequence if both courses are taken. Prereq: General undergraduate anatomy and physiology and Biocho- mistry 2410 or consent of instructor and 3311. Biochemistry 4120 also recommended. (Same as Zoology 5516-20). 4 hrs. and 1 lab. W, Sp

5710 Methods of Evaluating Experimental Data in Animal Science (3) Interpretation of data from ex- periments in animal science based upon such statis- tical procedures as analysis of variance, covariance, linear regression and correlation, and multiple re- gression. Prereq: Statistics 5211 or equivalent. 2 hrs and 1 lab. W

5720 Design and Interpretation of Experiments in Animal Science (3) Review of principles of ex- perimental design and application to research in animal science analyzing data from experiments with unequal and disproportionate subclass frequencies, situations and procedures for use of computers in statistical analyses. Prereq: 5710. 2 hrs. and 1 lab. W


6000 Doctoral Research and Dissertation (3-15) E

6150 Topics in Milk Constituents (3) Properties of milk constituents and relationship to milk and dairy products. Sp

6160 Topics in Dairy Microbiology (3) Microbiolo- gical problems related to various phases of the dairy industry. W
### Entomology and Plant Pathology

#### MAJOR DEGREE

**Entomology and Plant Pathology**

**M.S.**

**Ph.D.**

**Professors:**

C. L. Southard (Head), Ph.D. North Carolina State; J. W. Hilty, Ph.D. Ohio State; L. F. Johnson, Ph.D. North Carolina State; C. J. Southard (Head), Ph.D. North Carolina State; J. W. Hilty, Ph.D. Ohio State.

**Associate Professors:**


**Assistant Professor:**

M. R. Laemmle, Ph.D. Illinois.

**4010 Biology of Soil Microorganisms (4) Morphology and physiology of soil organisms, decomposition of organic matter, chemical transformations, and interactions between soil organisms and higher plants. Prereq: Introductory microbiology or 3130. 3 hrs and 1 lab. Sp.**

**4030 Forest and Shade Tree Entomology (3) Identification, biology, ecology, and control of forest and shade tree pests. Prereq: 3210 or equivalent. 2 hrs and 1 lab. F, A.**

**5000 Thesis (1-15) E**

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### Food Technology and Science

#### MAJOR DEGREE

**Food Technology and Science**

**M.S.**, Ph.D.

**Professors:**

J. L. Miles (Head), Ph.D. Wisconsin; J. L. Collins, Ph.D. Maryland; H. O. Brand, Ph.D. Illinois; C. C. Meller, Ph.D. Kansas State; W. W. Overcast, Ph.D. North Carolina State.

**Associate Professors:**

B. J. DeMott, Ph.D. Michigan State; S. L. Melton, Ph.D. Tennessee; M. J. Rieman, Ph.D. Kansas State.

**Assistant Professors:**

M. F. Davidson, Ph.D. Washington State; F. A. Draughn, Ph.D. Georgia; R. J. Mount, Ph.D. Ohio State.

**3020 Dairy Products I (4) Procurement, processing and distribution of fluid milk. Manufacture of frozen and condensed dairy products. 3 hrs and 1 lab. W.**

**5010 Research Methods and Instrumentation in Plant Pathology and Entomology (3) Techniques for laboratory, field, and greenhouse research in plant pathology and entomology. Prereq: 1 hr and 2 labs. F, W, Sp.**

**5110 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, causal agents and control measures. Prereq: 3110. Sp.**

**5120 Insect Diagnostic Clinic (3) Identification of insects and insects and their control. Prereq: 3210 or Zoology 3110. Sp.**

**5210 Plant Parasitic Nematodes (4) Morphology, physiology, taxonomy, and ecology of plant parasitic nematodes with emphasis on host-parasite relationships. Prereq: 6 hrs biological science or consent of instructor. (Same as Zoology 5210.) 2 hrs and 2 labs. W, A.**

**5220 Plant Disease Control (3) Basic problems and principles involved in controlling plant diseases. Prereq: 3110. W.**

**5230 Field Crop and Vegetable Insects (3) Taxonomy, biology, and control of insects affecting field and vegetable crops. Prereq: 3210 or equivalent course in applied entomology. 2 hrs and 1 lab. F. A.**

**5240 Plant Virology (4) Symptomatology, ecology and epidemiology of virus infection; structure, morphology, replication, transmission, purification, characterization, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and spiroplasmas. Prereq: 3130 or consent of instructor. 2 hrs and 2 labs. W, A.**

**5250 Medical and Veterinary Entomology (4) Morphology, taxonomy, biology, and control of arthropods parasites and vectors of pathogens of humans and animals. Ecology and behavior of vectors in relation to pathogen transmission and control. Prereq: 3210, general entomology, or consent of instructor. 3 hrs and 1 lab. Sp. A.**

**5260 Insect Pest Management (4) Principles and applications of biological, cultural, genetic, behavioral, and chemical methods of control to maintain pest populations below economic threshold levels. Prereq: 3210, Zoology 3110, or consent of instructor. 3 hrs and 1 lab. W, A.**

**5310 Special Problems in Entomology (1-6) Comprehensive individual study of current problems. May be repeated. Maximum 9 hrs. E.**

**5320 Special Problems in Plant Pathology (1-6) Comprehensive individual study of current problems. May be repeated. Maximum 9 hrs. E.**

**5330 Special Problems in Nematology (1-6) Comprehensive individual study of current problems. May be repeated. Maximum 9 hrs. E.**

**5410 Seminar (1) Review of literature and current research in plant pathology and economic entomology. May be repeated. Maximum 3 hrs, F, W, Sp.**

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### 3840 Meat Science (3) Processing methods, carcass characteristics of meat animals, slaughter, cutting, scaling, curing, freezing and cookery. 2 hrs and 1 lab. W, Sp.


### 4030 Dairy Products II (4) Principles in the manufacture of butter, cheese and special dairy products. Prereq: 3020. 3 hrs and 1 lab. W, Sp.

### 4130 Food Chemistry I (3) Minerals, fats, oils and vitamins in food as affected by processing and storage. Prereq: Nutrition 3320 or equivalent. 2 hrs and 1 lab. Sp.

### 4140 Food Chemistry II (3) Reactions of proteins, carbohydrates and natural food colorants in food materials. Protein structure, food enzymology and Browning reactions. Effects of storage and processing on proteins and carbohydrates with emphasis on nutritional value and function. Prereq: Nutrition 3320 or equivalent. 2 hrs and 1 lab. F.

### 4200 Food Processing II (4) Prevention of deterioration and spoilage of foods. Methods of preservation and packaging. Prereq: 2200 and Agricultural Mechanization 3510. 3 hrs and 1 lab. F.

### 4210 Food Additives (3) Substances used in food manufacturing with emphasis on properties and functions. Prereq: Nutrition 3020 or equivalent. S.

### 4300 Food Processing III (3) Water, sanitation and waste control in food industry. Prereq: Agriculture 1150 and Microbiology 2910-19 or equivalent.

### 4410 Food Crop Products (3) Food products from crops with emphasis on types, manufacturing systems, functional attributes, and utility. F.

### 4420 Bakery Products (3) Baking ingredients and their interactions during production and storage of bakery products. Prereq: 4130 and Chemistry 2230 or equivalents. 2 hrs and 1 lab. Sp.

### 4810 Microbiology in Food Manufacturing (3) Relations of food microbiology and food microorganisms in fermentative and enzymatic changes occurring during processing and manufacture of foods. Prereq: Microbiology 2910-19 or equivalent. 1 hr and 2 labs. F.

### 4820 Fermented Foods (3) Role of microorganisms in preparing foods with emphasis on development of certain desirable characteristics, flavor, aroma, texture, and keeping qualities. Prereq: Microbiology 3810. 2 hrs and 1 lab. Sp.

### 4840 Meat Products Manufacturing (3) Prepared meat products with emphasis on sausage making and information relating to cost controls, inspection, and meat science. Prereq: 3840 or consent of instructor. 1 hr and 2 labs. W.

### 4920 Analysis of Physical Properties of Foods (4) Physical states of food materials, water, viscosity, colloids, gels, foams, crystals, color. Qualification and changes induced by processing. Prereq: 4200 and Agricultural Mechanization 3510 or consent of instructor. 3 hrs and 1 lab. W.

### 4940 Advanced Meat Science (2) Qualitative and quantitative characteristics of meat and poultry as related to palatability, cookery, preservation, packaging and merchandising. Prereq: 3840. F.

### 5000 Thesis (1-15) E

### 5100 Seminar (1) Reports and discussions of selected topics from research literature. May be repeated. Maximum 3 hrs. F, W, Sp.

### 5120 Food Color (3) Chemistry of natural food pigments and measurement, notation, and preservation in food. Prereq: Nutrition 3320. 2 hrs and 1 lab. W.

### 5130 Food Enzymology (3) Commercial and native enzymes in food and their role on food quality and properties of food. Prereq: Nutrition 3330. Sp. A.

### 5140 Food Flavors (3) Food flavor maintenance and improvement. Natural and synthetic compounds in manufacture of foods with predictable consumer
acceptance. Technology of flavor manufacture and formulation. Techniques for determining flavor profiles. Prereq: 4210. 2 hrs and 1 lab. W, A

5150 Fats and Oils (3) Application of scientific principles to commercial technology of fats and oils. Prereq: 4130. 2 hrs and 1 lab. W, A

5200 Research (1-5) Research in selected areas. Consent of department head. Credits and hours to be arranged. May be repeated. Maximum 10 hrs. E

5310 Food Products Development (3) Fundamentals of art, science, and technology applied to research, development, and marketing of new food products and processes. Prereq: 4210. 2 hrs and 1 lab. F

5320 Food Thermobiology (3) Fundamentals of heat transfer as related to rate of destruction of microorganisms and to rate of loss of food quality through calculation of minimum safe thermal processes for hermetically-sealed packages of foods. Prereq: 4200. 2 hrs and 1 lab. W, A

5420 Advanced Food Quality Assurance (3) Applications of current instrumental methods used to control and monitor manufacturing processes. Prereq: 4140. 2 hrs and 1 lab. F

5510 Meat Technology (3) Physical and chemical changes that occur during conversion of muscle to meat; the influence these changes have on quality and composition; meat packaging, preservation, and quality control. Prereq: 3540. 2 hrs and 1 lab. Sp; A

5530 Microorganisms Common in Food Products (3) Identification of desirable and undesirable microorganisms as related to food products and processes. Prereq: 4810 or Microbiology 3810. 3 labs W

5540 Microbial Cultures in Foods (3) Physical and chemical environment and metabolism of microorganisms as related to cultured food products. Prereq: 4810 and Microbiology 3810. 2 hrs and 1 lab. Sp, A

Forestry, Wildlife and Fisheries MAJORS

MAJORS

DEGREES

Forest Science

B.S.

M.S.

Ph.D.

Associate Professors:


Assistant Professors:

H. S. H. Hitch, Ph.D. Michigan; R. J. Strange, Ph.D. Oregon State.

Forestry

*3200 Forest Environments and Ecology (3) Environments and food products of forests and associated lands; emphasis on the application of ecological principles to contemporary problems. Prereq: 8 hrs of biology, botany, or zoology. F

*3400 Dendrology and Silvics of Woody Angiosperms (3) Classification, nomenclature, identification, and silvical characteristics of the more common woody angiosperms native to North America; native ranges, distribution patterns, and habitat requirements; regeneration requirements and life history, placement in ecological significance and commercial importance. Weekly field trips during scheduled lab period plus one weekend field trip. Prereq: 8 hrs basic biology or botany. 2 hrs and 1 lab. F

*3500 Dendrology and Silvics of Gymnosperms (3) Classification, nomenclature, identification, and silvical characteristics of the major North American conifers, and other Gymnosperms; study of site characteristics and relationships including classification, life history, regeneration requirements, place in succession, and importance. Prereq: 8 hrs basic biology or botany. 2 hrs and 1 lab. W

*3110 Forest Measurements and Biometry (4) Measurements of individuals in animal and plant populations; linear regression; sampling of forest populations; growth and potential production. Prereq: Plant and Soil Science 3610 and Computer Science 1410 or equivalent. 3 hrs and 1 lab. W

*3120 Wood Technology (4) Wood properties; identification of commercial woods by macro and micro characteristics. Prereq: 3040, 3050. (3050 may be taken concurrently) 2 hrs and 2 labs. W

*3210 Forest Resource Economics (4) Allocation of forest resources within natural and management systems. Application of economics to forest resource decision making in private and public sector. Prereq: Economics 2120. F

*3220 Forest Products and Utilization (3) Harvesting, processing, and marketing of trees and forest products; intermediate and harvest cuts. Prereq: 3120. Sp

*3320 Principles of Silviculture (3) Influence of site factors on reproduction, growth, development, and character of forest vegetation; classification of forest structure; silvicultural laws. Prereq: 3020, 3040, Plant and Soil Science 2:30. Sp

*3730 Conservation (3) Forest resources of state, nation, and world; forests in soil and water conservation; wildlife management and recreation; conservations programs. W, Su

4002 Utilization (3) Wood-using industries: processing forest products—sawmills, tree-log-lumber grinders; pulpwood operations, flooring plants, treating plants; plant layout, flow diagrams. Prereq: 3120. Sp

4003 Field Methods of Timber Inventory (4) Field measurements of forest trees; timber cruising; determining appropriate sample size for specific purposes; tree and stand growth; site evaluation; field problems. Prereq: 3110 and Agricultural Mechanization 3140. Sp

4004 Forest Practice (3) Management of forest lands and implement rationalization of "multiple use" concept as it influences management decisions; impact of public pressure for outdoor recreation on management decisions; management prescriptions. Prereq: 4006. S/NC only. Sp

4006 Silvicultural Methods (4) Methods and application of intermediate and regeneration cuttings; site preparation, planting and seeding, modifications of cutting methods to obtain desired goods and benefits. Prereq: 3320, 4002, 4003. Sp

4020 Forest Watershed Management (3) Water as a forest resource; role of forests in the hydrologic cycle; control of water quantity, quality, and regimen; watershed planning. Prereq: 3320 or consent of instructor. Two overnight field trips. W

4210 Forestry Organization and Administration (3) Planning, organizing, and leadership concepts and principles; problem analysis and decision making in forest resource management. Prereq: Consent of instructor. 2 hrs and 1 lab. F

4220 Forest-Resource Management (4) The forest organization and management concepts and principles of forest management; the multiple-use concept; valuation of forest resources for decision making and planning; taxation of forest firm. Prereq: 4210. W

4230 Forest-Resource Management Plans (4) Field problems and case studies in forest-resource management; the forest as a system; management of forest enterprises as a producer of timber, recreational services, watershed services, and wildlife; economic and multiple-use multipurpose plans. Prereq: 4210. Sp

4240 Interpreting Forest Resources (3) Principles and techniques of interpretation of forest resources; importance of environmental interpretation to management of forest resources; development and administration of interpretive forest sites and interpretation field trip required. Prereq: 3240 or equivalent. 2 hrs and 1 lab. Sp

4330 Forest Policy (3) History of forestry in United States with emphasis on development of forest resource policies; current policies influencing development and management of forest resources; brief survey of policy implications of forest resource organizations in public and private sectors. Prereq: 4004. W

4340 Aerial Photography in Forest-Resource Management (3) Use of conventional aerial photography in forest resource management. May be repeated. S/NC only. 1 hr and 2 labs. Sp

4420 Forest Tree Improvement (3) Forest tree improvement related to silviculture, nature and purpose of tree improvement and forest genetics; principles of use of cytology and population genetics; importance of seed source; variation, selection of superior phenotypes and development of seed orchards; hybridization; seed production and seed certification. Prereq: 4006 or consent of instructor. 2 hrs and 1 lab. Sp

4430 Regional Silviculture of the United States (3) Factors that influence silviculture management of important tree species in North America. Importance of forests and forestry to a region; physiology, geology, soils, climate and weather; sites and site types, ecology, problems of protection, and silvical characteristics of the more important species. Prereq: 4006 or consent of instructor. W

4440 Forest Recreation (3) Forest lands as a recreation resource; the interrelationships of forest recreation and other management activities; development and management of forest recreation areas; socioeconomic and political determinants of recreation development and management. Prereq: 6 hrs sociology and/or economics. 2 hrs and 1 lab. Sp

4450 Recreational Behavior in Forest Recreation (3) Review of behavioral theories relevant to forest recreation planning, management, and administration. Implication and application of behavioral concepts to forest recreation problems, review of methodologies for assessing recreational behavior. Prereq: 3320 and 6 hrs in behavioral psychology and/or sociology, or consent of instructor. W

4540 Wood Drying and Preservation (3) Concepts of wood drying including wood-moisture relations, specific gravity, moisture content, density, and shrinkage. Concepts and drying practices. Relation of wood moisture content to attack by wood destroying insects in commercial treating systems. Prereq: 3120, Mathematics 1851, Physics 1220, or consent of instructor.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Recognized for the non-thesis student not otherwise registered during any quarter when such a student uses University facilities and/or faculty time before degree requirements. May be repeated. S/NC only. E

5011 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resources management. Identify, analyze, and pre-
Science (1-6) May be repeated. Maximum 9 hrs. E

5210 Seminar in Wildlife Conservation (3) Current studies, problems and issues in wildlife agencies and organizations and their programs. Prereq: 3230 or consent of instructor. W, A

5310 Seminar (1) Current developments in wildlife and fisheries science. Required of each graduate student in residence Winter Quarter. May be repeated. Maximum 2 hrs. S/N-nc only. W

5400 Advanced Topics in Wildlife Science (3) Recent advances and concepts, research techniques, and analysis of current problems. Prereq: 4450 and 4460 or consent of instructor. May be repeated. Maximum 6 hrs. Sp, A

5450 Wildlife Diseases (3) Necropsy of birds and mammals. Recognition of various diseases and methods of preparing pathological materials in the field and lab. Investigative procedures concerning wildlife diseases. Prereq: 1 yr zoology, 1 qr microbiology, pathology or parasitology, 4450 or 4460, or consent of instructor. 2 hrs and 1 lab. Sp, A


5500 Advanced Topics in Fishery Science (3) Recent advances and concepts, research techniques, and analysis of current problems. Prereq: 4520 or equivalent and Zoology 4240. W, A

5550 Fish Physiology (3) Mechanisms of circulation, excretion, osmoregulations, and neural/hormonal control of these systems in fishes. Practical applications of fish physiology in water pollution assessment, fish culture and fish management. Prereq: Consent of instructor. 2 hrs and 1 lab. W

5560 Industrial Forestry (3) Structure and analysis of wood-using firms and industries. Forest taxation, land tenure and wood procurement alternatives. Development and application of forestry planning models. Prereq: 4230 or consent of instructor. W

5700 Topics in Forest Industries Management (3) Current problems in industrial forestry. Executives from public and private business sector (concerned with forest industry) conduct classes in selected topics. Prereq: 4230 or consent of instructor. F

5800 Seminar in Forest Biomometry (3) Theory and application of forest measurements and sampling; tree, log and lumber quality; volume estimation techniques; growth and yield prediction. Prereq: 4003 or consent of instructor. Sp, A

5310 Seminar (1) Current developments in forestry. Required of each graduate student in residence Winter Quarter. May be repeated. Maximum 2 hrs. S/N-nc only. W

Wildlife and Fisheries Science

*3230 Wildlife Management (3) Lives and ecological relationships of wild animals; biological, social, and economic aspects of their management. 2 hrs and 1 lab. F

4450 Game Mammals (4) Classification, identification, distribution, natural history, and management principles of game mammals in North America. Prereq: 3230 or 1 yr of zoology. 2 hrs and 2 labs. F

4460 Game Birds (4) Biology, classification, identification, distribution, and management of game birds in North America. Prereq: 3230 or 1 yr of zoology. 3 hrs and 1 lab plus one weekend field trip. W

4510 Fish Populations (4) Principles and methods of fish population estimation; sampling techniques and equipment; population dynamics; age and growth. Prereq: Biology 3130, 8 hrs mathematics, or consent of instructor. 3 hrs and 1 lab or field period. W

4520 Fisheries Management (4) Methods of warm and cold water fisheries management including techniques of biological assessment, public relations, habitat manipulation, and stocking. Prereq: Biology 3130 or consent of instructor. 3 hrs and 1 lab or field period. Sp

5000 Thesis (1-15) E

5110 Special Problems in Wildlife and Fisheries Science (1-6) May be repeated. Maximum 9 hrs. E

*Graduate credit for non-forestry and non-wildlife and fisheries science majors only.

Ornamental Horticulture and Landscape Design

MAJOR

Ornamental Horticulture and Landscape Design

M.S.

Professors:

D. B. Williams (Head), Ph.D. Pennsylvania State; L. M. Callahan, Ph.D. Rutgers.

Associate Professors:


Assistant Professor:

D. T. Kendall, MLA Louisiana State.

*3030 Plant Propagation (3) Physiology, methodology, and environmental requirements for propagation. Prereq: 8 hrs of biological science. 2 hrs and 1 lab. F

*3110 Greenhouse Management (3) Factors involved in management of greenhouses for production and research. Structures, soils, pest control measures, heating, ventilating, lighting, water supply, crop succession. Prereq: Consent of instructor. 2 hrs and 1 lab. F, Sp

3620 Intermediate Landscape Design (4) Application of skills acquired in 3610 to variety of landscape projects. Refinement of graphic skills. History of landscape design relates to contemporary applications. Technical aspects of planning design and implementation. Use of plant materials in the design of small and moderate scale landscape situations. Prereq: 3610, 3610 equivalent. 1 hr and 2-3 hrs. F, W

3630 Landscape Construction and Contracting (4) Construction methods, materials and practices of landscape installation and contracting. Site layout procedures, excavation, drainage and pondage, landscape construction materials; application through detail design drawings and small scale projects. Landscape contracts, specifications and bidding procedures. Prereq: 3310, 3610; Agricultural Mechanization 2130 recommended. 1 hr and 2-3 hrs. Sp


4105 Nursery Management (3) Modern management methods for wholesale and retail nurseries, garden centers, and landscape contractors. Prereq: 3310. 2 hrs and 1 lab. W

1800 Park Design (4) Design criteria for parks and outdoors recreation systems. Park site selection, analysis, planning and management as related to needs and natural and economic resources. Evaluation of aesthetic and functional quality of parks and their impact on environmental quality of rural and suburban communities. Prereq: 3620. 2 hrs and 2 labs. Sp

4190 Advanced Landscape Design (4) Comprehensive application of landscape design skills and knowledge through design projects, design presentation, design analysis, presentation, design construction, design detailing, estimating, specifications, contracts and bidding. Prereq: 3510, 3620, 3630. 1 hr and 2-3 hrs. Sp

4220 Advanced Turfgrass Management (4) Principles and scientific basis of turfgrass culture: adaptation, ecology, physiology, soil fertility and grass nutrition; climatic influences on grass culture; physiology of clipping and water management; traffic effects and compaction; and the physiological influences of pest infestations and control measures. Prereq: 3210. 3 hrs and 1 lab. W

4320 Flowericulture (3) Specific practices in production of minor cut flower and potted plant crops. Production methods for scheduling flowering or vegetative growth of specialty florist crops in controlled environments. Prereq: 3410. 2 hrs and 1 lab. F

4400 Individual Problem Study (1-5) May be repeated. Maximum 10 hrs. E

5000 Thesis (1-15) E

5100 Special Problems in Ornamental Horticulture and Landscape Design (3) May be repeated. Maximum 9 hrs. E

5210 Golf Course Design, Development, and Management (4) Principles and applications in design, maintenance, operation and development of golf courses. Selection and utilization of grass varieties and other plant materials and development of specifications, fertilization, nutrition, and mechanical and chemical maintenance. Financing and equipment, labor management, and public relations. Prereq: 4220 and consent of instructor. 2 hrs and 1 lab. F

5310 Park and Public Grounds Management Systems (4) Design criteria affecting management systems requirements. Protection and cultural care of trees, shrubs, and turf in parks and public grounds; use pressure modification and maintenance of park and recreation facilities. Resource management and performance analysis. Development and analysis of maintenance systems and specifications. Maintenance programming. Prereq: 4180 or consent of instructor. 2 hrs and 2 labs. F

5410 Histological Microtechnique (4) Preparation of plant tissues for microscopic examination, paraffin and plastic embedding, microtomy and mounting of sections, dyes and staining schedules and photography. Prereq: General biology or botany; general and organic chemistry; and consent of instructor. 2 hrs and 2 labs.

5500 Seminar (1) Current literature and development of ornamental horticulture and landscape design. May be repeated. Maximum 3 hrs. F, Sp

5515 Advanced Nursery Production (4) Preparation and use of growing media for woody ornamental plants; nutrition of ornamental plants including di-
Plant and Soil Science

MAJOR

Ph.D. Plant and Soil Science

DEGREES

M.S., Ph.D.

Professors:

L. F. Seatz (Head), Ph.D. North Carolina State; F. F. Bell (Emeritus), Ph.D. Iowa State; D. L. Cook (Emeritus), Ph.D. Purdue; W. L. Parks, Ph.D. Purdue; J. H. Reynolds, Ph.D. Wisconsin; L. N. Skold, M.S. Kansas State; M. E. Springer (Emeritus), Ph.D. California (Berkeley); W. D. Swingler (Emeritus), Ph.D. Louisiana State.

Associate Professors:


Assistant Professors:

D. E. Deyron, Ph.D. North Carolina State; W. W. McIver, M.S. Virginia State; R. J. Miles, Ph.D. Texas A & M; D. R. West, Ph.D. Nebraska; J. D. Wolf, Ph.D. Auburn.

3200 Crop Ecology (3) Crops and environment, geographic location; site, heat, light, water and inter-plant relationships as a basis for judgment of cultural practices used to modify environmental factors. Pre-req: 8 hrs biological science. 2 hrs and 1 lab. Sp

3400 Crop Physiology (3) Physiology of crop plants; growth phenomena related to crop production; use of general theories of physiology; effects of temperature, light, heat, air, minerals, and water. Pre-req: 8 hrs biological science. 2 hrs and 1 lab. W

3110 Soil Fertility and Fertilizers (4) Properties of soils in relation to a plant nutrient availability and uptake. Methods of soil fertility evaluation and principles of fertilizer use; manufacture and properties of fertilizers. Pre-req: 2130, 3 hrs and 1 lab. W

3120 Grain and Oil Crops (3) Distribution, improvement, morphology, culture, harvesting, and utilization of corn, small grains, grain sorghum, soybeans and related crops. Pre-req: 2130. 8 hrs biological science. 2 hrs and 1 lab. W

3140 Forage Crops (4) Characteristics, adaptation, improvement, management, and utilization of grasses and legumes for pastures, hay, and silage. Pre-req: 2130, 8 hrs biological science. 3 hrs and 1 lab. F

3160 Cotton and Tobacco (4) Characteristics, adaptation, improvement, culture, harvesting, and marketing of cotton and tobacco. Pre-req: 2130, 8 hrs biological science. 3 hrs and 1 lab. F

3180 Fruit Crops Management (4) Soils, planting, cultivation, development of fruit crops plantations, pest control, harvesting, packing, storage, and pruning. Pre-req: Entomology and Plant Pathology 3130 and 3130. 3 hrs and 1 lab. W

3220 Soil Management (4) Soil management for crop production including cropping systems, fertilizer use, and tillage operations for specified soil and farming conditions. Pre-req: 2130. 3 hrs and 1 lab. Sp

3250 Soils in Forestry (3) Soil as a medium for tree growth; relation of physical, chemical, and biological properties of soils to tree growth and management of forest stands; principles of important soil properties and management of soil resources. Pre-req: 2130, Forestry 3250. 2 hrs and 1 lab. W

3510 Commercial Production of Cool Season Vegetables (3) Characteristics, economic importance, adaptability, and production for fresh and processing markets; emphasis on potatoes, asparagus, celery, cole-root, bulb crops, perennials, and Irish potatoes. Pre-req: 8 hrs biological science. 2 hrs and 1 lab. F

3520 Commercial Production of Warm Season Vegetables (3) Characteristics, economic importance, adaptability, and production for fresh and processing markets; emphasis on sweet potatoes, beans, tomatoes, pepper, cucurbits, sweet corn, and okra. Need market analysis. Pre-req: 8 hrs biological science. 2 hrs and 1 lab. Sp

3610 Interpretation of Agricultural Research (3) Statistical methods in interpretation of research results. Pre-req: Mathematics 1550, F

3710 Principles of Weed Science (4) Basic principles of weed science, history, ecology, economic losses, means of control, types of herbicides, and specific recommendations for various crop and non-crop uses. Pre-req: 8 hrs biological science and 3 hrs organic chemistry. 3 hrs and 1 lab. Sp

4110 Soil Chemistry (4) Colloidal systems; properties and behavior of colloidal soil materials; relations of chemical properties to plant nutrient availability. Pre-req: 2130 and Physics 1210. 3 hrs and 1 lab. F

4120 Principles of Crop Breeding (4) Genetic principles and techniques used in crop improvement. Pre-req: 8 hrs biological science or consent of instructor. 3 hrs and 1 lab. W

4250 Agricultural Chemicals and the Environment (4) History of agricultural chemicals used for action; degradation, and environmental impact of chemicals used in agriculture, forestry, and related areas with emphasis on agricultural pesticides; environmental safeguards imposed by federal and state regulations on chemical development and use. Pre-req: 1 yr biological science and 1 yr chemistry. 3 hrs and 1 lab. F

4320 Soil Formation, Morphology, and Classification (4) Soil formation; properties, distribution, and classification of soils; interpretation of morphology; use of soil surveys. Pre-req: 2130, 3 hrs and 1 lab. Sp

4400 Problems in Plant and Soil Science (1-6) May be repeated. Maximum 9 hrs. E

5000 Thesis (1-15) E

5100 Special Problems in Plant and Soil Science (1-6) May be repeated. Maximum 9 hrs. E

5200 Soil Crop Relationships (3) May be repeated. Maximum 6 hrs. Su

5240 Soil Productivity and Management (3) Concepts of soil productivity and management, quantitative evaluation of factors and their interaction affecting soil management decisions, cropping systems, water control and management, tillage and fertility management. Pre-req: evaluation of specific soil management programs. Pre-req: 3220 and 4110 or consent of instructor. Sp, A

5250 Pedology (4) Factors and processes of formation as related to physical, chemical, and mineralogical properties of soils; soil in an ecosystem; classification of soils. Pre-req: 4320 or consent of instructor. 3 hrs and 1 lab. W, A

5310 Design and Interpretation of Experiments (4) Experiments, statistical procedures, effects and different variables on precision of experiments; problems dealing with the analysis of data. Pre-req: 3610 or equivalent. 3 hrs lec, 1 hr rec, and 1 hr disc. W

5340 Soil Physics (3) Chemical and physical relationships among solid, liquid, and gaseous phases of soil mass; relation to plant growth and soil management. Pre-req: 4110. 2 hrs and 1 lab. W, A

5370 Advanced Soil Fertility (3) Fundamental concepts of soil fertility; how they relate to nutrient absorption by plant roots; interrelation of these concepts in soil fertility and management. Pre-req: 4110, W, A

5390 Soil Physical Chemistry (3) Structural properties of soil minerals determining physicochemical reactions, ion exchange. Donnan Equilibrium, double layer theory. Pre-req: 4110, Chemistry 4110 or concurrent registration. Sp, A

5600 Seminar (1) May be repeated. Maximum 3 hrs. E

5710 Advanced Plant Genetics (3) Mutation systems: controlling elements, induced mutations, genome organization, polyplidy, tetrasomy, inheritance, extrachromosomal inheritance, apomixis, incompatibility systems, and genetic engineering of plants. Prereq: Basic genetics or consent of instructor. F, A

5720 Quantitative Genetics (3) Genetic constitution of population and changes in gene frequency, recognition and measurement of continuous variation, estimation of variable components and genetic advance under different breeding procedures. Prereq: Basic genetics or consent of instructor. A, W

5750 Advanced Plant Breeding (4) Historical development of plant breeding concepts and methods, effects of heterosis, inbreeding, hybridization and selection. Improvement of self- and cross-pollinated crops. Pre-req: 5710. 3 hrs and 1 lab. W, A

5810 Crop Climatology (4) Meteorological factors affecting crop plants; crop distribution and centers of origin; general and specific climatic, weather, and vegetative systems; microclimatic influences on plant growth. Pre-req: 3020, 3040; or Botany 3210, 4310 or consent of instructor. 3 hrs and 1 lab. F, A

5820 Advanced Crop Physiology and Ecology (4) Historical development of research in crop physiolo- gy and ecology. Relationships between physiologi- gic processes and environmental factors. Crop adaptation to specific environmental conditions. Pre-req: (3020, 3040 or Botany 3210, 4310 or consent of instructor. 3 hrs and 1 lab. W, A

5850 Mechanisms of Herbicide Action (3) Principles of the uptake, translocation, mode of action and basis of selectivity of herbicides. Effects of herbicides on plant morphology, metabolic systems and enzymatic activities. Prereq: Botany 3210 and Biochemistry 4110 or consent of instructor. Sp, A

6000 Doctoral Research and Dissertation (3-15) E

6100 Special Topics in Soil Science (3) May be repeated. Maximum 9 hrs. E

6200 Special Topics in Plant Breeding (3) May be repeated. Maximum 9 hrs. E

6300 Special Topics in Crop Physiology and Ecology (3) May be repeated. Maximum 9 hrs. E

6410 Experimental Designs (3) Principles of experimental designs used in agricultural research. Completely randomized, randomized complete block and Latin square designs; factorial experiment and confounding; lattice designs, and covariance. Pre-req: 5310, F, A

6510 Growth Control with Chemicals (3) Character, theories of action and use of auxins, gibberellins, cytokinins and inhibitors. Range of effects on growth. Pre-req: Botany 3210 or equivalent. 2 hrs and 1 lab. W, A

6600 Seminar (1) May be repeated. Maximum 3 hrs. E

College of Veterinary Medicine

H. Kitchen, Dean
C. F. Feed, Associate Dean
W. H. Grau, Jr., Associate Dean

The College of Veterinary Medicine, established in 1974, is organized into six academic departments: Animal Science (jointly with the College of Agriculture),
Environmental Practice, Microbiology (jointly with the College of Liberal Arts), Pathobiology, Rural Practice and Urban Practice. The College administers a professional curriculum leading to the degree of Doctor of Veterinary Medicine (see the General Catalog) and a graduate program involving all departments and leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. The instructional program of the College also includes internship and residency training programs in various clinical specialities in the departments of Environmental Practice, Urban Practice, Rural Practice and Pathobiology. (For details write the Director of Residencies and Internships, College of Veterinary Medicine.) Because of the interdisciplinary departmental administration of the College of Veterinary Medicine, the faculty have opportunities in the graduate programs of other instructional units, including Animal Science (nutrition and physiology), Microbiology (bacteriology, virology and immunology), Ecology (environmental toxicology), Public Health, and Comparative and Experimental Medicine. (Refer to other sections of this catalog for a full description of these programs.) The majority of the graduate students and graduate faculty of the College of Veterinary Medicine are involved in the Comparative and Experimental Medicine program (see page 94). This program provides a wide spectrum of interdisciplinary training that prepares graduates to assume positions in biomedical environments and in teaching or research capacities involving humans or animals.

Departments of Instruction

Environmental Practice

Professors:

Assistant Professors:

5000 Thesis (1-15) E


5011-12 Pharmacology (1,2) Theories of transport across membranes. Introduction to principles of drug action and distribution. Receptor theory, adverse drug reactions; correlated with Animal Science 8240-50. Prereq: Consent of instructor.

6000 Doctoral Research and Dissertation (3-15) E

6010 Advanced Topics in Environmental Medicine (1-3) Current and future research methodology, laboratory situation, recent advances in instrumentation involved in analytical techniques for environmental medicine. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Pathobiology

Professors:
R. L. Michel (Head); V. M. D., Ph.D., Michigan; M. D. McGavin, M.V. Sc., Ph.D., Michigan; L. N. D. Potgieter, B.V. Sc., Ph.D., Iowa.

Associate Professors:

Assistant Professors:

5000 Thesis (1-15) E

5010 Comparative Pathology (5) Lectures and lab. Emphasis on pathogenic mechanisms. Comparative aspects considered. Lectures reinforced by lab study of gross, microscopic and ultrastructural lesions. Prereq: Zoology 3060, 3320. F, A

6020 Special Problems in Pathobiology (1-5) Projects of varying nature in necropsy, histopathology, clinical pathology, clinical parasitology, clinical immunology, clinical bacteriology and mycology, and clinical virology. May be repeated. Maximum 20 hrs.

6000 Doctoral Research and Dissertation (3-15) E

6010 Special Topics in Pathology (1-3) Emphasis on pathogenic mechanisms. Comparative aspects considered. Lectures reinforced by lab study of gross, microscopic and ultrastructural lesions. Prereq: Zoology 3060, 3320. F, A

6052 Pathogenesis and Diagnosis of Virus Diseases in Domestic Animals (5) Biology of viruses and pathology of virus infection in domestic animals. Prereq: Biochemistry 4110-20, 4119; Microbiology 4430, 4432; consent of instructor.

Rural Practice

Professor:
H. T. Barron (Head), D.V.M. Texas A & M.

Associate Professors:
D. C. Goble, D.V.M., Kansas; F. M. Hopkins, D.V.M. Georgia.

5000 Thesis (1-15) E

6000 Doctoral Research and Dissertation (3-15) E

Urban Practice

Professors:
E. D. Gage (Head), D.V.M. Texas A & M; D. J. Krahanskel, D.V.M. Auburn.

Associate Professors:

5000 Thesis (1-15) E

6000 Doctoral Research and Dissertation (3-15) E

Animal Science/Veterinary Medicine

Professors:
R. H. Johnson (Head), Ph.D. Ohio; G. R. Bratton, D.V.M., Ph.D. Texas A & M.

Associate Professors:

Assistant Professors:

Veterinary Medicine

5343 Patterns of Disease (5) Host-agent relationship in disease of animals. Pathogenesis, laboratory diagnosis, control, and public health significance. Principles of epidemiology and application in study of diseases in animal populations. Prereq: Consent of instructor and Director, Comparative and Experimental Medicine Graduate Program.

5382 Veterinary Toxidology (3) Pharmacologic basis and pathologic features of diseases of animals caused by common toxic chemicals: clinical manifestations, diagnosis, and treatment. Prereq: Consent of instructor and Director, Comparative and Experimental Medicine Graduate Program.

5383 Public Health (2) Public health aspects of veterinary medicine and nature of related laws, ordinances and regulations. Veterinarian's role in protection of environment, ecology, and quantity and quality of food. Prereq: Consent of instructor and Director, Comparative and Experimental Medicine Graduate Program.

5372 Comparative Medicine (4) Diagnosis, prevention, and treatment of diseases of laboratory animals, avian species, and marine mammals, seen most commonly by practicing veterinarians. Prereq: Consent of instructor and Director, Comparative and Experimental Medicine Graduate Program.

5375 Principles of Medicine (4) Physiological and pathological principles underlying mechanisms of disease. Selected examples of human and animal diseases: recent advances in principles of veterinary medicine. Prereq: Consent of instructor and Director, Comparative and Experimental Medicine Graduate Program.

Microbiology

Professors:
A. Brown (Head), Ph.D. Chicago; R. W. Beck, Ph.D. Wisconsin; B. T. Rouse, Ph.D. Guelph; J. M. Woodward, Ph.D. Kansas.

For specific course listings please see College of Agriculture, Department of Animal Science, and College of Liberal Arts, Department of Microbiology.
Graduate programs of the College of Business Administration are designed to prepare men and women to assume executive, managerial and professional positions in the increasingly complex world of domestic and international business and industry, teaching and research, government and institutional management.

Viewing the business firm as operating in a dynamic social, political and economic environment which demands leaders capable of dealing with innovation and rapid change, the College places central importance on development of students' thought processes rather than on specialized subject matter and courses descriptive of past practices. Emphasis is focused on flexibility of mind, receptivity to new ideas, capacity to adapt one's reasoning powers and judgment to rapid changes, vigor and imagination in using the mind, ability to reason analytically and logically and, above all else, inculcation of an irrepressible desire to continue to learn and grow in knowledge throughout the student's life.

Graduate Programs

The College of Business Administration offers programs leading to seven advanced degrees: the Doctor of Business Administration, the Doctor of Philosophy with majors in Economics and in Management Science, the Master of Arts and the Master of Arts in College Teaching with a major in Economics, the Master of Science with majors in Economics and Statistics, the Master of Science with majors in Business Administration, and the Master of Business Administration. Each course is 3 quarter hours of graduate credit. Thus, the total program may consist of from 60 to 81 quarter hours.

Prerequisites. Upon matriculation, the student must have received a bachelor's degree from a regionally accredited institution, but there are no specific course prerequisites required to begin the program except college level mathematics through at least one course in calculus. Those electing the management science or statistics concentration must have completed two years of college level calculus. Those admitted to the accounting concentration should plan on up to two additional quarters for undergraduate prerequisite courses that are taken during the first year of the program. Although not required, completion of undergraduate courses in certain areas may qualify the student for exemption from some core courses. (See information under "Exemption from Core Courses" on page 34.)

MBA Core. The following courses are required in each student's program unless an exemption from one or more courses is granted as provided below under the heading "Exemption from Core Courses." All courses are 3 credit hours. The core courses are:

Accounting 5010, 5020, 5030; Business Administration 5310; Business Law 5010; Economics 5010, 5020, 5030; Finance 5010, 5020; Management 5010, 5020; Management Science 5010; Marketing 5010, 5020; Mathematics 5052; Office Administration 5050; Statistics 5010, 5020.

1Accounting 5020 and 5030 are waived for students who complete the concentration in accounting.
2See notation under the heading "MBA Concentration" in the Management Science Program section (page 41).
3See notation under the heading "MBA Concentration" in the Statistics Department section (page 44).
### Prerequisite Relationships of MBA Core Courses

Read across table to identify prerequisites/corequisites for courses listed in left column

- **x** Prerequisite
- **=** Prerequisite or corequisite
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*UTK Math 1550, 5051 or equivalent.

### Concentration and Electives

A concentration area(s) 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 27 hours of MBA program core course work. Selection of an area(s) early in the program is encouraged to facilitate proper course sequencing. Requests for changes in concentration area(s) must be submitted to the Graduate Business Programs office for approval.

Among the 8 courses in the concentration/electives block, at least 4 but not more than 6 must be in one of the following concentration areas (for specific courses required in some concentration areas, see departmental sections on following pages):

- Accounting
- Economics
- Finance
- Forest Industries Management
- Governmental Financial Administration
- Management Science
- Marketing
- Real Estate and Urban Development
- Statistics
- Transportation and Logistics

The remaining elective courses (2 to 4) must be in fields outside the concentration area, normally selected from MBA courses offered in other departments of the College, and may comprise a second concentration area of 4 courses. Up to 2 courses (6 hours) in this block may be taken outside the College of Business Administration. No more than 3 courses numbered below 5000 may be included in this 8-course block.

### Exemption from Core Courses

A student may be exempted from certain core courses on the basis of having recently completed equivalent undergraduate courses in these subjects with grades of C or higher at a regionally accredited institution. "Recently completed" means, for mathematics, completion of the last course or regular use of math tools within three to four years of matriculation, and for other areas within five to six years of matriculation. Courses in this category (and the approximate undergraduate equivalent work) are:

- Accounting 5010 (6 quarter hours, fundamentals of financial accounting)
- Business Law 5010 (6 quarter hours, the legal and social environment of business)
- Economics 5010 (9 quarter hours, principles of economics—macro and micro)
- Mathematics 5052 (12 quarter hours, including college algebra and calculus. See topics included in Mathematics 5051 and 5052)
- Office Administration 5050 (3 quarter hours, introductory course in computer science with programming).

In addition to the above, a graduate of an AACSB accredited undergraduate business program may request exemption from one or both of the core courses in the area of his/her undergraduate major field, provided at least 30 quarter hours (20 semester hours) of course work were completed in the major area no more than five years prior to matriculation.

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1Not available to students whose undergraduate major was accounting. Such students should choose another area or apply for admission to the Master of Accountancy program. (See page 37).

2Available to residents of West Virginia under terms of the Academic Common Market. (See page 33).
and a grade average of 3.0 or higher (on a 4.0 scale) was earned for all courses in the major. Students requesting such an exemption must petition the appropriate department head. The department may require the student to pass a proficiency examination over any course for which exemption is requested. (See page 15).

A minimum of 60 quarter hours of graduate credits is required to earn the degree. If a student qualifies for exemption from a course in addition to those provided for in the two categories described above, whether by proficiency examination or otherwise, an additional elective course approved by the student’s advisor will be included in the student's curriculum for each such exempted course so as to meet the 60-hour minimum requirement.

Students holding degrees from foreign institutions normally may not be exempted from taking core courses.

**Transfer Credits.** Graduate level courses taken at other AACSB accredited institutions that otherwise conform to University policy (page 15) may be credited toward MBA degree requirements within the following limits:

- **MBA Core:** 6 hours
- **Concentration Area:** 9 hours (provided at least 12 hours of course work at this institution are included in each concentration area)
- **Elective Area:** 3 hours

The maximum number of hours that may be transferred is 9 quarter hours.

**Other Requirements.** The Application for Admission to Candidacy (see page 19) must be approved by two faculty members in the student's area(s) of concentration and the Assistant Dean for Graduate Programs in the College of Business Administration, signed by the department head, and submitted to the Graduate Office.

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(s) and a B average or higher in the overall program. In lieu of passing a written comprehensive examination the student must satisfactorily demonstrate his/her ability to analyze and solve multi-functional problems of the administrative processes and policy determination and to integrate the concepts of the various disciplines embodied in the curriculum of the program. The student is tested in these areas in the courses of the MBA core, particularly in the capstone course, Business Administration 5310—Business Policy, as well as in work required in the concentration areas.

**Application and Admission.** Applications are accepted to begin the full-time program in the summer, fall, and winter quarters. There are no admissions for spring quarter. All applicants may be considered for fall quarter entry (cold-Swatson), the MBA program entry (mid-June) is for students whose programs will include all core courses. Only undergraduate business majors and those who are exempted from Accounting 5010, Business Law 5010, Economics 5010, and Mathematics 5051 (or equivalent) may begin the program in the winter quarter (early January).

Part-time (evening) program students whose programs include Accounting 5010 and Economics 5010 must begin in the fall quarter. Others may begin either fall or winter, or in the summer if the schedule includes one or two courses for which they are eligible.

There are four rounds of admission decision actions during the year as indicated in the table below. These dates are coordinated with the scheduled receipt of the latest Graduate Management Admission Test (GMAT) score reports. To be considered at one of the four admission sessions, 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 applicant evaluations and the GMAT score report. The first two items should reach The Graduate School 10 days before the MBA application deadline to allow for internal processing. Other items should reach the Graduate Business Programs office by the deadline date.

For admission to the MBA program, consideration is given to the applicant’s academic record with particular attention to the last two years of undergraduate work and previous graduate studies, to scores on the GMAT and the Test of English as a Foreign Language (TOEFL) for those whose native language is not English, to work experience and other activities which demonstrate potential for leadership, and recommendations from professors or 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.

**Dual J.D.-MBA Program**

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferment of both Doctor of Jurisprudence and the Master of Business Administration degrees.

**Admissions.** Applicants for the J.D.-MBA program must make separate application to, and be competitively and independently accepted by, the College of Law for the J.D. 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 apply for approval to pursue the dual program any time 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 required for the J.D. degree and the last 24 quarter hours required for the MBA degree.

**Curriculum.** A dual program candidate must satisfy the graduation requirements of each college. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from the other 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 8 semester hours of credit toward the J.D. degree for acceptable performance in a maximum of 12 quarter hours of approved graduate level courses offered by the College of Business Administration. Three of the 12 quarter hours must be earned in Accounting 5030 or a more advanced accounting course. If College of Law credit is given for such an accounting course, the student may not receive credit for another law course 6859—Legal Accounting.

The College of Business Administration will award up to 12 quarter hours of credit toward the MBA degree for acceptable performance in a maximum of 8 semester hours of approved courses offered in the College of Law.

Except while completing the first year courses in the College of Law, students are encouraged to maximize their academic studies be started prior to entry into the dual program by taking courses in both colleges each quarter.

**Awarding 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 Law School course in which the student has earned a 2.3 grade average or higher. 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 DBA Program

The basic objective of the Doctor of Business Administration program is to provide the student an opportunity to attain the intellectual competence necessary to meet the highest standards for advancement to a professional position in an academic institution, business and industry, or government. The student will develop a sound foundation for expanding knowledge in the student's chosen area of concentration and will contribute through research to advancement of the state of knowledge in this area. Moreover, the student's educational experience should develop perspective toward education for business in a manner that will enable the student to spearhead innovation and change in response to needs.

The DBA program is structured around four major features. First, it recognizes the interdisciplinary thrust of business education and provides the student with a sound foundation for expanding the body of knowledge related to business systems and their interactions with other socioeconomic systems and environmental forces. Second, the student's program is flexible enough to respond to individual needs and interests yet is formulated within a sound framework to achieve overall objectives. Third, emphasis is placed upon conceptual foundations and analysis of decision-making processes rather than the descriptive aspects of business administration. Fourth, the student does advanced work in the basic disciplines of economic theory, behavioral science and quantitative science to provide the necessary foundations for research.

Foundation Requirements. Although the program is designed for students who have completed an accredited MBA (or equivalent) degree program, those with outstanding undergraduate records in any area may be admitted directly to the DBA program and may apply the MBA degree in a coordinated program of study. Program prerequisites include at least one year of college mathematics to include a course in calculus, a course in statistics, knowledge of computer programming, and intermediate course work in each of the basic disciplines of economic theory, behavioral science and quantitative science. Further, the student must demonstrate, by completing course work indicated or by passing appropriate examinations:

- Quantitative Science: 12 quarter hours in one or a combination of two of the following areas: statistics, management science, econometrics, or computer science.
- General Education Requirements: 36 quarter hours. The core curriculum includes courses in the basic disciplines underlying the study of business administration, the student's concentration area and a supporting area. Following are the requirements for each area:

A. Business Functional Areas. Each student must demonstrate a thorough understanding of the basic disciplines underlying the study of business administration, the student's concentration area and a supporting area. Following are the requirements for each area:

   1. Marketing, operations management, and behavioral science: 27 quarter hours. A student, with the approval of the Assistant Dean for Graduate Programs, may substitute 18 quarter hours of graduate course work in the functional areas for the required 24 quarter hours of graduate course work in the functional areas. In such cases, the student must complete 9 hours of graduate course work in the basic disciplines. Students may choose the supporting area to be complementary to, but not required in an area outside, but related to, the concentration area.

B. Basic Disciplines. Each student must demonstrate, by passing appropriate examinations:

   1. Economics and Management Science: 12 quarter hours. Students who choose this field as a supporting area take Management 570 and 5680.

C. Concentration Area. This is the focal point of the program and the area in which the student expects to do his/her research and dissertation. A minimum of 36 quarter hours of course work is required, including 9 hours of doctoral seminars taken at this University. A study of research methodology of the discipline is included. Graduate work in the field taken at other institutions is considered by the student's committee in determining additional course work required. Available concentration areas are:

   - Accounting
   - Finance
   - Management
   - Marketing
   - Transportation and Logistics

D. Supporting Area. A minimum of 12 quarter hours of graduate course work is required in an area outside, but complementary to, the concentration area. The student may choose the supporting area from one of the following: one of the business functional areas or one of the basic disciplines or a related area in another school or college of the University. The program of study should be arranged with an advisor in the discipline chosen and must be approved by the student's committee.

Comprehensive Examinations. Comprehensive written examinations over the concentration and supporting areas are required of each person seeking candidacy for the DBA degree. The dissertation area examination is administered in two sessions of approximately four hours each and the supporting area examination in one session of approximately four hours. The examining committee may, if it deems advisable, supplement the written examinations with oral examinations and may accept the results of only an oral examination for a supporting area in the College of Law. Scheduling of comprehensive examinations will be determined by the examining committee in each of the five concentration areas in coordination with the Assistant Dean for Graduate Programs. The committee must designate two periods during the calendar year and announce the dates at least 90 days in advance. A student who fails an examination on the first attempt must repeat the examination over that area at the next examination period, the results of which shall be final.

Admission to Candidacy. A student may apply for admission to candidacy for the DBA degree after maintenance of at least a B average in course work, successful completion of comprehensive examinations and acceptance of a research proposal for the dissertation by his/her faculty committee. Admission to candidacy must be approved at least three quarters prior to the date the degree is conferred. (Admission in the fall quarter permits graduation in the following spring quarter.) See sections headed "Doctoral Committee" and "Admission to Candidacy," page 36. 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 area and supporting area). Graduate courses accepted from other institutions must be included. Under "Other Requirements" indicate date of acceptance of the research proposal by the Faculty committee. The application must be approved by the student's faculty committee and the Assistant Dean for Graduate Programs in the College of Business Administration before submission to the Graduate Program Committee.

Research and Dissertation. (minimum of 36 quarter hours). The purpose of the segment is to provide the candidate with a research experience that meets the general standards of the profession. The dissertation is supervised by the candidate's faculty committee, who must certify its completion and acceptability after the candidate's oral defense of his/her research effort.

Other Requirements. For information concerning program admission requirements, academic performance standards, fellowships and assistantships, and general rules and regulations of The Graduate School, see other parts of the catalog, "The Graduate School," Also see "Academic Common Market," page 36.

Minimum Academic Performance Standards

A graduate student in the College of Business Administration whose grade point average at any point after 12 hours is below 3.0 shall be placed on probation. A student on probation shall be dropped from the program unless his/her cumulative graduate grade point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 quarter hours of course work attempted which is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Programs of The College of Business Administration upon recommendation of the student's faculty committee.

Admission Requirements

General admission requirements for The Graduate School are stated on pages M.Acc., MBA, and DBA applicants are required to take the Graduate Management Admission Test (GMAT). Applicants for
programs in economics, management science, and statistics may submit results of either the GMAT or the Graduate Record Examination (GRE) as part of their application. Applicants for management science and statistics programs must have completed at least two years of college-level calculus and be proficient in a computer language.

Applicants whose native language is other than English must submit results of the Test of English as a Foreign Language (TOEFL). Scheduled dates and locations for taking these examinations may be obtained from Educational Testing Service, P. O. Box 966, Princeton, New Jersey 08540, and from most colleges and universities.

In addition to procedures required for admission to the Graduate School (pages 29-31), M.Acc., MBA and DBA applicants must submit additional information on forms provided by the College of Business Administration. The application for all programs and supporting materials should be submitted at least three months prior to desired entry date.

The College of Business Administration is fully accredited by the American Assembly of Collegiate Schools of Business and is one of 700 colleges and universities in the United States and worldwide accredited by the American Assembly of Collegiate Schools of Business. The faculty for the TEDP consists of senior professors who teach business-related subjects in the University's graduate programs in the College of Business and industry. The TEDP faculty is augmented by outstanding practitioners in their fields of business and industry.

Fellowships and Assistantships

Fellowships. Information concerning nonservice fellowships administered by The Graduate School as well as application blanks may be obtained from the Graduate Office.

Assistantships. A limited number of teaching assistantships and assistantships that range from 10 to 20 hours of service per week are available through the departments of the College. Remuneration includes payment of fees and out-of-state tuition as well as monthly stipend. Awards are generally made on the basis of need and performance on the admission test. Application forms may be obtained in any of the departments or from the office of the Assistant Dean for Graduate Programs. Applications must be received by March 1 for consideration of assistantships to be awarded for the following fall term.

Center for Business and Economic Research

The staff of the Center for Business and Economic Research engages in studies of the business and economic environment in Tennessee, the southeast, and the nation. The Center serves the business community, state government, individuals, and the University through dissemination of various kinds of economic and socioeconomic information and supports the faculty of the College in seeking funding for research projects. Staff members conduct research in regional economics, public finance, and areas related to socioeconomic problems in the region. The Center publishes the results of its own research and that of others in monograph form so that significant developments in the various business disciplines and economics can achieve widespread exposure. In addition, the Center staff does contract research on business and economic problems for governmental organizations and private industry. The Center publishes periodically the Tennessee Statistical Abstract and quarterly the Survey of Business. The Center is a member of the Association for University Business and Economic Research.

Management Development Programs

The Management Development Programs offers a wide variety of programs ranging from two- to three-day public seminars and customized "in-plant" programs to the four-week Tennessee Executive Development Program.

The Tennessee Executive Development Program (TEDP) is designed to provide continuing educational opportunities for executives from firms and organizations in Tennessee, the South, and the nation. The major objective of the program is to prepare and develop executives for increasingly higher levels of management responsibility and to sharpen existing executive skills needed for comprehensive decision making and leadership. Other major aims of the TEDP are to teach the fundamentals of analytical thinking and the use of the decision tools, and to examine the economic, political, technological and other environmental factors affecting the firm's operations.

The TEDP limits enrollment to thirty-six participants who live on campus for a total of four weeks spread over a three-month period. This arrangement provides executives with extensive opportunities to exchange ideas and operational concepts with contemporaries in other business areas and with TEDP faculty as well.

The faculty for the TEDP consists of senior professors who teach business-related subjects in the University's graduate programs and nationally recognized professors of other institutions. Each participating faculty member has extensive experience in either consultation with or actual operation in business and industry. The TEDP faculty is augmented by outstanding practitioners in their fields of business and industry.

Departments of Instruction

Accounting and Business Law

J. E. Kiger (Head), Ph.D. Missouri, C.P.A.

Accounting

MAJOR: Accounting

DEGREE: M. Acc.

Professors:


C.P.A.; J. R. Williams, Ph.D. Arkansas, C.P.A.

Associate Professors:

H. C. Herrings, Ill., Ph. D. Alabama, C.P.A.

I. A. Possley, M. S. Tennessee, C.P.A.; C.M.A.;

J. H. Scheurer, Ph. D. Ohio State, C.P.A.;


Assistant Professors:

C. D. Hard, Ph.D. Mississippi, C.P.A.;

M. C. Lendersinger, M.S. Tennessee, C.P.A.;

J. M. Reeves, Ph.D. Oklahoma State, C.P.A.;

H. G. Bohm, Ph.D. Polytechnic Institute, C.P.A.; M. G. Tiller, D.B.A. Indiana.

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 a baccalaureate accounting background and a high level of ability in and a broad understanding of accounting and an interest in pursuing a career in professional accounting.

Foundation Requirements. Although the program is designed for students who have completed an accredited baccalaureate degree program with a major in Accounting, those with outstanding undergraduate records in any area may earn the M.Acc. degree by completing prerequisites in accounting and by including courses in other business and related disciplines to supplement the applicant's undergraduate background.

Course Requirements for the M.Acc. Program. A student's program encompasses a minimum of 45 quarter hours of graduate course work. Specifically, the student must complete courses in and meet the requirements of the disciplines and in the area of accounting as indicated below. Each course is 3 quarter hours of graduate credit.

Business Core (14 quarter hours):

Economics 5030, Finance 5420, Mathematics 5052 and 4 additional courses from the following areas, subject to approval of the program advisor (no more than one course may be taken in any one area): Business Policy, Business Law, Computer Science, Economics, Management, Management Science, Marketing, Finance, Statistics, and Transportation.

Accounting Core (15 quarter hours):

Accounting 5110, 5120, 5210, 5420, 5640.

Accounting Electives (select 4-12 quarter hours): Accounting 5130, 5140, 5160, 5220, 5430, 5440, 5510, 5640, 5990.

1Prior course work will be considered in determining the Business Core courses.

2An exemption may be granted for Mathematics 5052 if student has recently completed undergraduate course work of equivalent content with grades of C or higher at a regionally accredited institution. "Recently completed" means completion of the last course or regular use of math tools within three to four years of restrictive instruction.

3Selected courses from other disciplines may be substituted for accounting electives upon approval of the M.Acc. program advisor.
Other Requirements. To qualify for the degree, the student must achieve a B average (3.0) in the business core courses and also a B average in the accounting courses. Each student must pass a final written comprehensive examination during the final quarter of study for the degree. M.A. Requirements: Accounting DBA Concentration: Accounting M.B.A. Concentration: Accounting Accounting 5110, 5120, 5210, 5420, and two of the following: 5320, 5330, 5340.

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5010 Financial Accounting (3) Introduction to accounting model of firm and accounting information system. Not available to students with credit for 2110-20 or equivalent. F, Su

5200 Corporate Reporting Problems (3) Analysis of uses and limitations of accounting model of firm. Emphasis on external and internal uses of general purpose financial reports. Prereq: 5010 or equivalent. F, W

5300 Managerial Accounting (3) Analysis of the model as a vehicle for planning and controlling activities. Attention to development of cost data appropriate to managerial decision models. Prereq: 5020. Economics 5010. Prereq or coreq: Management Science 5010, Statistics 5020. W, Sp

5110 Seminar in Accounting Theory (3) Evolution of accounting theory, concepts underlying financial reporting models, and authoritative accounting literature. Case analysis and measurement of potential performance and financial position. Prereq: Consent of department head. May not be taken by students with credit for 4990.

5120 Seminar in Advanced Auditing (3) Theory and concepts underlying the philosophy of auditing as related to current auditing issues. Prereq: 4120 or equivalent.

5130 Selected Topics—Current Accounting Practice (3) Critical in-depth consideration of selected financial reporting topics of particular relevance to current accounting practice. Prereq: 5110.

5140 Selected Topics—Current Accounting Theory (3) Critical in-depth consideration of selected issues in the financial accounting literature. Prereq: 5110.

5160 Graduate Internship in Accounting (3) Full-time resident professional employment for one academic term. Leadership and critical decision-making skills, written report of responsibilities, and evaluation of student performance. Prereq: Consent of instructor.

5210 Seminar in Advanced Managerial Cost Accounting (3) Analysis of conceptual and current issues impacting on development and practice of managerial cost accounting. Cost allocation, planning, and control using a variety of methods, current issues and decision-making processes. Prereq: 3230 or consent of instructor.

5220 Budgetary Planning and Control Systems (3) Application of techniques of organizing, budgeting and controllers to meet organization's needs and objectives. Control systems and corporate structure and organization of unitary companies, management decisions, cost center transfers, pricing, and control in not-for-profit organizations. Prereq: 3220 or 5030.

5310 Auditing Concepts (3) Concepts and theory of auditing, environment of internal and external auditing, ethics, fraud, external and internal control, evaluation, and reporting. Not intended for persons who have credit for auditing course. Prereq: 3130. Prereq or coreq: Economics 4520.

5510 Advanced Income Tax (3) Federal income taxation with emphasis on tax planning and research. Prereq: 3120 with C or higher; 3430 with C or higher. (Available only to M.B.A. students who do not have credit for 4430.)

5330 Advanced Income Tax (3) Federal income taxation with emphasis on tax planning and research. Prereq: 3120 with C or higher; 3430 with C or higher. (Available only to M.B.A. students who do not have credit for 4430.)

5340 Consolidations and Business Combinations (3) Theory and practice of accounting for interrelated business entities—domestic and foreign. Not intended for persons who have credit for a course with a similar content. Prereq: 3130.

5420 Tax Research (3) Development of expertise in tax research utilizing tax service, tax periodicals, legal cases and other available sources. Includes individual research projects. Prereq: 4430 or equivalent.

5430 Tax Planning (3) Advanced study of income tax problems emphasizing alternatives available to minimize tax liability compatible with achieving taxpayer objectives. Prereq: 5420.

5440 Taxation of Estates and Gifts (3) Transfers at death, intestate transfers, life insurance, annuities and employee death benefits, marital and other deductions and exclusions, and estate and gift tax returns. Prereq: 4430 or 5330 and 5420. (Not available to students with credit for 4440.)

5510 Not-for-Profit Accounting (3) Theory and practice of budgetary and fund accounting, financial reporting, measures of output and accomplishment, analysis of financial and performance auditing for nonprofit entities. Prereq: 9 hrs of accounting and consent of instructor.

5600 Accounting Systems and EDP Concepts and Control (3) Elements and operations of computer in business environment. Analysis, design, implementation, documentation, and control of accounting systems. Prereq: 2130 and knowledge of a computer programming language.

5640 Seminar in Accounting Information Systems (3) Literature on accounting information systems and advanced systems analysis and design concepts. Informational needs of other functional areas of business and interfacing of these areas. Prereq: 4630 or equivalent.

5910-20-30 Accounting Seminar (1, 1, 1) Research and discussion of contemporary issues in practice of accounting. May be repeated. Admission by consent of department head. S/NC only.

5950 Seminar in Accounting Research (3) Integration of areas of financial, managerial, tax, and auditing, including directed problem-oriented research in selected topics. Prereq: 5120, 5210, 5420. (Not available to M.B.A. students.)

5990 Individual Research in Accounting (3) Directed research in a topic of mutual interest to student and faculty member. Prereq: Consent of department head in quarter prior to anticipated enrollment. May be repeated. Maximum 6 hrs.

6000 Doctoral Research and Dissertation (3-15) E

6110-11-20 Doctoral Seminar in Accounting (3, 3, 3) Analysis of issues reflected in accounting literature. Prereq: 9 hrs of graduate credit in accounting and consent of instructor.

Business Law


5610 Legal and Social Environment of Business (3) Survey of legal and quasi-lega! institutions with emphasis on those which have particular significance to business, basic legal notions and principles that pertain to business management. Not available to students with credit for 4110-20 or equivalent. F, W, Su

5130 Administrative Regulation of Business (3) Federal Register System and Administrative Procedure Act and their relationship to business. How a regulation is made and enforced. Other legal controls of administrative agencies. Not available to students with credit for 4130 or equivalent. Prereq: 4120 or 5010 or consent of instructor.

Business Administration

MAJOR DEGREES Business Administration, M.B.A., DBA, MBA

5310 Business Policy (3) Case studies covering policy formulation and administration; point of departure—top and middle management, where company-wide objectives are set and departmental policies and activities coordinated, sizing up company's situation, determining objectives, developing sound policies, organizing and administering personnel to reach company objectives, continuous administrative reappraisals. Enrollment priority given M.B.A. students at last quarter of their program. Prereq: All M.B.A. core courses. F, W, Su

5410 Business and Its Societal Environment (3) Analysis of current forces and changes in society and interrelation of plans and actions in business firms with environmental factors. Prereq: Consent of instructor.

5610 Seminar in Advanced Business Analysis (3) Application of business concepts and analytical skills to problems of small businesses in community. Students work in teams under supervision of participating professor. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

Business Education

See College of Education

Economics

MAJOR DEGREES Economics M.A., MACT, M.S., Ph.D.

Professors: P. D. Quade (Head), Ph.D. California (Berkeley); R. T. Pool, Ph.D., Texas; S. L. Carroll, Ph.D., Harvard; W. E. Cole, Ph.D. Texas; G. R. Fiebelk, Ph.D. McGill; C. J. Garrison, Ph.D. Kentucky; J. F. Holly (Emeritus), Ph.D. Clark; H. E. Jensen, Ph.D., Texas; F. T. 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; G. A. Spiva, Ph.D. Texas.

Associate Professors: H. S. Chang, Ph.D. Vanderbilt; E. Glusstoff, Ph.D. Stanford; H. W. Hoop, Ph.D. Maryland; D. L. Kahanman, Ph.D. Florida; K. E. Phillips, Ph.D. Washington (Seattle); A. M. Schlottman, Ph.D. Washington (St. Louis).

Assistant Professors: D. Clark, Ph.D. Michigan State; C. D. Dorn, Ph.D. Massachusetts Institute of Technology; R. A. Hofier, B.A. Old Dominion; J. W. Mayo, M.A. Washington (Seattle); C. D. Florida; K. L. Murphy, Ph.D. Michigan State; H. Thompson, Ph.D. Houston; E. D. Witcham (part-time), Ph.D. Rochester.

THE MASTER'S PROGRAM

The minimum requirements for a graduate major in Economics for the Master of Arts and the Master of Science degrees consist of the following: (1) Economics 5111-12 and 5121-22; (2) 9 additional hours in Economics at the 5000 level or above; (3) a thesis, or an additional 9 hours in Economics at the 5000 level or above to be concentrated in one field. Students electing the non-thesis option will be required to pass a final written comprehensive examination.

The requirements for a graduate minor in Economics are as follows: Either (1) 5111-12 and 5121-22, or (2) 5111 and 5121-22, or (3) with

*Honors Distinguished Service Professor
the consent of the head of the economics department, an alternative sequence of 9 hours to meet unusual conditions.

MASTER OF ARTS IN
COLLEGE TEACHING DEGREE

The requirements for the MACT degree are listed on page . A thesis is required.

THE DOCTORAL PROGRAM

Subject Area Requirements

1. Students will be required to complete requirements in core subject fields as indicated:
   a. Economic theory: by comprehensive examination or by completion of Economics 5111-12 and 5121-22 with a B average or higher, and successful completion of Economics 6111 and 6121.
   b. Economic history: 6 hours of economic history at the 5000 level or above.
   c. History of economics: Economics 5150 and 3 hours at the 6000 level.
   d. Mathematical and quantitative methods: Economics 5180, 5190, and 5510. The 5510 requirement may be waived for students preparing Economics 6170, 6180 and 6190.

2. Students must achieve a grade average of B or higher for all courses offered to fulfill requirements of subparagraphs b, c, and d, or as an alternative, may petition to satisfy any one or all of these fields by some other means such as comprehensive examination.

3. Students will be required to demonstrate their competence by comprehensive examination in three fields with the approval of the department, at least two of which must be selected from the following: economic development; economics of centrally planned economies; labor and human resources; industrial organization; international economics; regional and urban economics; a field, as agreed to by the department, combining two or three of the above.

Exceptions to the foregoing are discouraged but may be petitioned by writing directly to the department head who will decide with the advice of an ad hoc committee of three members of the faculty. This petition is to be submitted at least nine months before the student takes the comprehensive exam in question.

Course Requirements. Candidates for the Ph.D. degree in Economics will be required to complete a minimum of 72 quarter hours of course work beyond the Bachelor's degree, plus the dissertation which carries 36 quarter hours of credit. At least 54 hours shall be in economics.

MBA Concentration: Economics.
Minimum Course Requirements for MBA Concentration: As approved by the area MBA faculty advisor.

4000 Special Topics (3) Student generated course offered at convenience of department upon student initiative. Subject matter and contents determined by students and instructor with approval of the department.

5000 Thesis (1-15)

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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.

5011-12 Problems in Lieu of Thesis (3, 3)

5090 Workshop in Economics (3-9) Special topics in economic education. Not available for credit in any College of Business Administration degree program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5910-20-30 Economics Seminar (1, 1, 1) Research in progress and discussion of selected topics. May be repeated. S/N/C only. E

6000 Doctoral Research and Dissertation (3-15)

ECONOMIC THEORY

4110 Managerial Economics (3) Application of economic theory to business decision making; emphasis on profit objectives, measurement and forecasting demand and costs, and capital budgeting. Prereq: 2110-20-30.

4130 Business Cycles (3) Fluctuations in income, employment, prices, and output in the economics system; subjects discussed are the historical facts concerning booms and depressions, statistical methods for analyzing business fluctuations, theoretical explanations of cycles, and policies that have been proposed to combat them. Prereq: 3120 or consent of instructor. Sp

4150 History of Economic Thought (3) Development of economic thought, tools of analysis, and economics as a social science, together with an analysis of the economic conditions which influenced this development. Period covered: 1776 through 1936. Prereq: 1 yr of principles of economics and microeconomics.

4170-80 Introduction to Mathematical Economics (3, 3) Application of mathematical methods in theoretical study of micro- and macroeconomic phenomena. Designed for beginning graduate students who have limited training in analytic geometry and calculus. Must be taken in sequence. Prereq: 3110 and college algebra, calculus, and analytic geometry, or equivalent. F, W

5010 Introduction to Economic Analysis (3) Analytical tools of macro- and microeconomics for students without prior training in economics. Price determination, national income measurement and determination, and banking system. Not available to students with credit for 2110-20-30 or equivalent. F, S, Su

5020 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and optimizing techniques. Prereq: 5010 or equivalent. Prereq or coreq: Statistics 5020 or equivalent.

5030 Economic Fluctuations, Forecasting, and Stabilization (3) Macroeconomic environment of the firm. Determination of level of output, employment and prices for economy as a whole. Implications of aggregate fluctuations for individual firm. Role of forecasting techniques and stabilization policies. Prereq: 5010 or equivalent. F, W, Sp

5110 Fundamentals of Microeconomics (3) Verbal arguments and geometric and algebraic techniques. Theory of consumer behavior and demand; theory of production and cost, long and short run theories of profit maximizing firm in both perfectly competitive and monopolistic environments; theory of derived demand. For students whose major is other than economics. Not available for students with credit for 5111. Prereq: 3110 or equivalent. F, W, Sp

5111-12 Microeconomic Theory I, II (3, 3) Theory of consumer choice and demand; theory of the firm; theory of production and costs; market structures; derived demand, factor pricing; introduction to welfare economics, capital theory. Should be taken in consecutive quarters. Prereq: 3110 or equivalent. F, W

5120 Fundamentals of Macroeconomics (3) Determination of levels of employment and prices for economy as a whole; relationships between interest rates, price expectations, productivity, and quantity of money; aggregate saving, investment, and liquidity preference. For students whose major is other than economics. Not available for students with credit for 5121. Prereq: 3120 or equivalent. W

5121-22 Macroeconomic Theory I, II (3, 3) Money, credit and income-expenditure approaches to questions of income and price level determination; applications to contemporary macroeconomic problems. Should be taken in consecutive quarters. Prereq: 3120 or equivalent. W, Sp

5150 History of Economic Thought (3) Development of economic ideas from mercantilists through Alfred Marshall; emphasis given to classical and neoclassical tradition.

5180 Mathematical Methods in Economics (3, 3) Applications of basic concepts in differential and integral calculus, difference and differential equations, linear algebra and stochastic models to topics in theory of firm, growth models, game theory, linear programming, and decision making under uncertainty. Prereq: 1 yr of calculus. Sp; F

5510 Qualitative Methods in Economic Research (3) Methods of estimation and testing of economic relationships with use of time series and cross section data, with applications to current economic problems. Prereq: Introductory statistics or Statistics 5211 or equivalent.

5530 Introduction to Econometrics (3) Statistical demand analysis, production and cost analysis, distribution of income and wealth, models of growth and macroeconomic applications. Should not be taken by students who contemplate taking Economics 6170-80. Sp

5710 Public Finance: Revenues (3) (Same as Finance 5710.) F

5720 Public Finance: Expenditures (3) (Same as Finance 5720.) W

5740 Seminar in Public Finance (3) (Same as Finance 5740.) W

5810 Financial Markets and Intermediaries (3) (Same as Finance 5810.) W

5820 Monetary Theory and Policy (3) (Same as Finance 5820.) F

5830 Commercial Bank Management (3) (same as Finance 5830.) F, Sp

6111 Advanced Microeconomic Theory I (3) Consumer behavior, production, and exchange in partial and general equilibrium settings. Prereq: 4170, 4180, 5112, or equivalent. F

6121 Advanced Microeconomic Theory II (3) Topics in macroeconomic theory and policy. Prereq: 5122 or equivalent. W

6150-60 History of Economic Doctrines (3, 3) Impacts of economic thinkers from Middle Ages to present. W, Sp

6170-80-90 Econometric Methods, 3, 3, 3 Theory and techniques of statistical testing of economic hypotheses and construction and estimation of econometric models. Review of classical least squares regression model, extensions of least squares regression model, and approaches to simultaneous equation models with applications to current econometric research. Prereq: 5180-90 and 5510 or equivalent. W, Sp

6710-20 Seminar: Fiscal Theory and Public Finance (3, 3) (Same as Finance 6710-20.)

INTERNATIONAL TRADE AND ECONOMIC DEVELOPMENT

4230 Problems in International Trade and Economic Development (3) Problems or problem areas of current importance in fields both of international economics and economic development. Prereq: 3510 or 3520. W

4231 The Political Economy of Latin America (3) Description, analysis, and comparison of major economic problems and policies of various Latin American countries. Sp

4232 The Political Economy of Asian Development (3) Description, analysis, and comparison of major economic problems and policies of India, China, and Southeast Asian countries.
5620 Seminar in Capital Markets (3) Theory of analysis of asset values in efficient and inefficient markets. Prereq: 6410. W

MONETARY POLICY AND FINANCIAL INSTITUTIONS

5810 Financial Markets and Intermediaries (3) Capital formation and allocation of capital in U.S. economy. Problems of saving, partial institutionalization of these savings, investments of financial intermediaries, efficiency of allocation process. Control of economy, and impact of financial institutions on financial markets. (Same as Economics 5910.) W

5820 Monetary Theory and Policy (3) Relationship of money, credit and liquidity as related to income, interest rates, employment and prices as well as examination of effect of monetary policy on economic activity. Prereq: Economics 5020 or equivalent. (Same as Economics 5820.) F

5830 Commercial Bank Management (3) Bank management decision-making analysis of changes in banking environment and structure; acquisition and management of funds; current banking problems. Prereq: Consent of instructor. (Same as Economics 5830.) F, Sp

6110-20 Seminar: Monetary Theory (3, 3) Study of money, credit and liquidity as related to income, interest rates, employment, output, and prices. F, Sp

6810 Financial Institutions and Markets (3) Theory of financial markets, role of financial institutions, and analysis of market efficiency.

GOVERNMENTAL FINANCIAL ADMINISTRATION

5710 Public Finance. Revenues (3) Allocative, distributive, and stabilization effects of alternative revenue systems. Prereq or coreq: Economics 5020 or equivalent. (Same as Economics 5710.) F

5720 Public Finance: Expenditures (3) Functions and distributing aspects of public sector, public goods, and benefit/cost analysis. Prereq or coreq: Economics 5020 or equivalent. (Same as Economics 5720.) W

5730 Finance Administration of Government (3) Budgeting and cash management in public sector. Prereq: Economics 5020 or consent of instructor. Sp

5740 Seminar in Public Finance (3) Selected topics: public choice, pricing government services, fiscal policy, and fiscal dynamics. Prereq: 5710 or consent of instructor. (Same as Economics 5740.) Sp

6710-20 Seminar: Fiscal Theory and Public Finance (3, 3) Advanced topics in fiscal theory and policy. (Same as Economics 6710-20.) F, Sp

INSURANCE

5110 Theory of Risk Management (3) For students with no background in risk and insurance. Risk management and manageable risks facing individual and firm. Analysis of risk management techniques with emphasis on insurance as a tool. W

REAL ESTATE AND URBAN DEVELOPMENT


5200 Real Estate Analysis (3) Analysis of real property investment, real estate finance and appraisal theory. Prereq: Finance 5610 or Planning 5465 or consent of instructor. W

5130 Housing and Urban Land Markets (3) Analysis of housing demand, supply and location. Segregation and housing discrimination. Impact of urban renewal and public policy on housing markets. Prereq: 5110 or consent of instructor. Sp

5410 Real Estate Investment and Taxation Analysis (3) Analysis of economic factors and institutions which underlie real estate investment decision making. Corequisite used. Prereq: 5120 or consent of instructor. Sp

Management

Professors:

Associate Professors:
- F. A. Chambin, MBA Indiana; O. S. Fowler, MBA Georgia; J. C. McAdoo, Ph.D. Texas; C. W. Neel, Ph.D. Alabama; M. C. Rush, Ph.D. Akron.

Assistant Professors:
- J. A. Bachmann, Ph.D. Virginia Polytechnic Institute; K. C. Gilbert (Visiting), Ph.D. Tennessee; R. T. Ladd, Ph.D. Georgia; G. B. Roberts, MBA Georgia State; C. R. Woolam, Ph.D. Texas Tech.

MBA Concentrations: Management, Forest Industries Management.

DBA Concentration: Management.

Minimum Course Requirements for MBA Concentrations: Management—As approved by the area faculty advisor. Forest Industries Management—5110, 5130; Forestry 5260, 5270.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-19) Required for the non-thesis student not otherwise registered during any quarter when such a 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.

5100 Organization Theory and Behavior (3) Basic concepts of organization theory, organizational behavior and management processes.

5200 Operations Management (3) Management processes of planning, operating and control of production systems. Management concepts and quantitative techniques to support day-to-day work to operating problems. Prereq: 5100; Management Science 5160; Statistics 5202. Sp, Su

5110 Organization Theory (3) Analysis and design of organization structure.

5130 Managerial Planning and Control (3) Processes of management planning and controlling with emphasis on corporate strategic planning.


5170-80-90 Seminar in Industrial and Organizational Psychology (3, 3, 3) Introduction to basic concepts and ideas required for graduate study in industrial and organizational psychology. Must be taken in sequence or during the student first year. (Same as Psychology 5170-80-90.) F, W, Sp

5210 Personnel Management (3) Analysis and appraisal of the personnel function.

5220 Wage and Salary Administration (3) Analysis of problems, programs, and practices.

5230 Human Problems in Administration (3) Review and critique of research in industrial human relations. (Same as Psychology 5460.)

5250-60 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.

5260 Independent Study, Project or Research in Management (1-3) Topic of mutual interest to student and faculty advisor only by prearrangement with supervising faculty member. May be repeated. Maximum 6 hrs. S/NC or letter grade.

5320 Management Problems in Industrial Research (3) Basic administrative problems encountered in management of industrial research and engineering programs, and comparable programs in which professional personnel predominate. F, A.

5410-20-30 Production Management (3, 3, 3) Quantitative approach to solution of production management problems. Prereq: 5020 or consent of instructor.

5920 Organizational Behavior (3, 3) Behavioral methodology and perspective, including review of empirical behavioral research in organizations. Must be taken in sequence. F, W

5930 Research Methods in Management (3) Methodological issues in management research. Review of experimental design, measurement problems, data sources and collection, and application of statistical methods, followed by critique of student research proposals. Prereq: DBA student status or consent of instructor. S/NC only.

5710 International Business Management (3) Analysis of environment of international business firms and impact of internal and external factors on managerial decisions. Sp

5810 Energy Management: Theory and Practice (3) Management of energy resources in operating systems: decision-making, trade-offs, system analysis, energy audits, technical parameters, conservation methods, worldwide energy supply and demand, new energy technologies.

6000 Doctoral Research and Dissertation (3-18) E

6110 History of Management Thought (3) Significance of historical ideas leading to present state of art of management.

6120 Advanced Organizational Theory (3) Analysis of functioning of complex organizations: structure, culture, and adaptation.

6130 Seminar in Contemporary Management Issues (3) Contemporary management policy issues. May be repeated.

6250-60-70 Seminar in Industrial and Organizational Psychology (3, 3, 3) Advanced problems in organizational psychology. Areas include performance evaluation, executive development, group process, and morale. (Same as Psychology 6250-60-70.)

6380 Seminar in Industrial and Organizational Psychology (3) (Same as Psychology 6380.)

6990 Field Work in Industrial and Organizational Psychology (1-15) F, Sp. Max. 6 hrs for each 30 hrs of such practice. Maximum 15 credits. (Same as Psychology 6990) E

Management Science

MAJOR

DEGREE

Management Science

Ph.D.

Professor:
- R. S. Garfinkel (Chairperson), Ph.D. Johns Hopkins.

Associate Professors:
- J. K. Ho, Ph.D. Stanford; R. E. Rosenthal, Ph.D. Georgia Institute of Technology.

Management Science Committee:
- Members of the Management Science faculty and in addition: R. W. Bolling, Management; J. S. Bradley, Mathematics; E. Glueck, Economics; W. J. Morse, Accounting; R. E. Birnbaum, Finance; C. C. Thigpen, Statistics; M. G. Thompson, Computer Science; C. R. Woolam, Management.

MBA CONCENTRATIONS

For students whose MBA concentration area is Management Science, the MBA Core is revised as follows: substitute Management Sequence 5310 for 5300 in MBA Concentrations, and with approval of student's advisor, substitute Statistics 5120 for 5200. The
MBA Concentration: Marketing.
DBA Concentration: Marketing.
Minimum Course Requirements for MBA Concentration: 5300, 5350, 5400, 5410.

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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


5340 Application of Management Science Methods (3) Application of methods from 5310 through 5330 to large-scale management problems. 5330 may be taken concurrently. Su

5810 Special Topics in Management Science (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5910 Management Science Problems (1-6) Directed study in subject of mutual interest to student and staff member. E

6000 Doctoral Research and Dissertation (3-15) E

6110-20-30 Models for Production Systems (3, 3, 3) Seminar providing research practice to enhance professional development of doctoral students. In- vestigation of cutting mathematical models for production processes and opportunities for original research.

6210-20 Network Flows (3, 3) In-depth treatment of variational and dynamic flow; flow with gains, and other advanced topics. Prereq: 5310 or equivalent. A

6310 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables. Prereq: Mathematical Programming 5110.

6410 Large Scale Mathematical Programming (3) Development of solution strategies for large-scale mathematical programming problems that have many constraints, many variables or extremely sparse constraint matrices. Prereq: 5310 or equivalent. A

6510 Nonlinear Optimization (3) Solution of constrained and unconstrained nonlinear optimization problems focusing on algorithms that have performed well in recent practice. Prereq: 5310 or equivalent. A

6510 Markovian Decision Models (3) Formulation and analysis of Markov Chain models, Markov Chain models which incorporate decisions—their formulation, solution and application through policy iteration. Stochastic dynamic programming applications in continuous time. Prereq: 5330. F

6620 Queuing Models (3) Application and mathematical analysis of models of congestion. Basic birth-death process models, other Markovian models: non-Markovian models for systems with general service or arrival patterns, priority customers or other complicating assumptions. Prereq: Mathematics 4750-60. Sp.

6710 Location Models (3) Application of linear, nonlinear and network optimization techniques to problems of optimal location of new facilities. Prereq: 5310 or equivalent. A

6810 Special Topics (3) Prereq: 5310-20-30 and consent of instructor. May be repeated. Maximum 9 hrs.

6910-20-30 Management Science Seminar Series (1-3, 1-3) Subject selected from recent management science literature. F; W; Sp.
of marketing strategy, both domestic and international. Prereq: 5010. Coreq: 5010, 5110, 5130, 5220.

5210 Sales Force Management (3) Basic communication theory affecting objectives and problems of sales force management. Recruitment, selection, training, motivation, evaluation, and control of sales force, territorial design, and routing. Prereq: 5200. F, Su

5220 Promotion Management (3) Management of promotional activities within firm: advertising, publicity, sales promotion. Emphasis on advertising, setting objectives, budgeting, segmentation, media selection, and evaluation of effectiveness. Prereq: 5200. Sp

5230 Analysis and Design of Marketing Systems (3) Macrostochastic approach to marketing system. Conceptual framework for examining marketing agency and channel interrelationships, public policy, cost and efficiency, and innovation in marketing from viewpoint of decision maker. Prereq: 5200. Sp

5300 Marketing Research (3) Investigation and solution of problems; application of research methods to functional areas of marketing. Research concepts; methods, and techniques. Prereq: 5200. Statistics 5010, F, W

5350 Buyer Behavior Analysis for Marketing (3) Buyer behavior patterns with emphasis on implications to marketing and executive decision making. Marketing and behavioral sciences. Prereq: 5200. F, Su

5400 Analyzing Market Opportunity for Marketing Decisions (3) Plants of opportunity within markets, framework for identifying and organizing information required to assess market opportunity. Approaches to analyzing buyers in markets, forecasting need for goods, analyzing industry/channel/competitor service. Emphasis on applying market opportunity analysis results to marketing decision making. Prereq: 5200. W

5410 Advanced Marketing Strategy (3) Components of marketing strategy including development of marketing mix. Consideration of alternative strategies. Coordination and control of marketing activities. Prereq: 5300 and 5350. Sp

5450 International Marketing Management (3) Development and management of international marketing programs. Problems involved in marketing goods and services in foreign markets. Political, cultural, and economic conditions in different countries. Prereq: 5200. W

5990 Research in Marketing (3) Directed research on problems of mutual interest to student and staff member. Prereq: 5200 and 5300. May be repeated. Maximum 6 hrs.

6000 Doctoral Research and Dissertation (3-15) E

6100 Seminar in National Policy (3) Critical analysis of contemporary national transportation policy issues. Prereq: 5110. F

6210 Seminar in Transportation and Logistics Models (3) Analysis of contemporary models and methodologies in transportation and logistics research. Relative emphasis on topical coverage at discretion of instructor. Prereq: Management Science 5010 or equivalent.

6220 Research Methodology in Transportation and Logistics (3) Philosophy and design of research in transportation and logistics.

Office Administration

J. Stallard, Program Director

Professors: E. W. Davis (Emeritus), M.S. New York; D. Reese, Ph.D. Iowa; E. R. Smith, Ph.D. Ohio State; J. Stallard, Ph.D. Ohio State; G. A. Wagoner (Emeritus), M.S. Indiana.

Associate Professor: B. J. Brown, Ed.D. Tennessee.

Assistant Professors: P. Campbell, M.S. Austin Peay; H. Petree, M.S. Tennessee.

Courses numbered below 5000 are not available for credit in the MBA program.

4310 Business Letter Writing (3) Principles, practices, and mechanics of effective business letters and memoranda; principles applied by solving communication cases; emphasis placed on letters and memos as initial sources of ideas in communications system of the business firm.

4320 Business Report Writing (3) Basic principles and procedures of preparing business reports, both formal and informal in style; writing techniques for short and long reports; graphic presentation and interpretation; use of primary and secondary data for reports.

4420 Advanced Transcription (3) Improvement of ability to transcribe an audible copy from dictation of a wide variety of correspondence; emphasis on competencies needed to meet occupational standards. Prereq: 4410. F

4510 Office Management (3) Strategic and operational planning of office objectives; relating tasks and human resources to objectives; relating tasks and human resources to objectives; directing of office staff through leadership, motivation, and organizational planning of office objectives; directing of office staff through leadership, motivation, and organizational planning of office objectives; directing of office staff through leadership, motivation, and organizational planning of office objectives.

4520 Office Systems (3) Synthesis of systems and subsystems applicable to centralized and decentralized office functions. Emphasis placed on cost analysis in contemporary office environment, technology, and research analysis.

4810-20-30 Problems in Office Administration (1-3, 1-3, 1-3) Subject and title vary each quarter. May be repeated. Maximum 6 hrs for each course.

5011 Problems in Lieu of Thesis (3)

5050 Data Processing in Business (3) Fundamentals of data processing, computer programming and applications; systems design. Available only as stated on page 33. E
Statistics

MAJOR

DEGREE

Statistics

M.S.

Professors:

C. C. Thigpen (Head), Ph.D. Virginia Polytechnic Institute; D. S. Chambers (Emeritus), MBA Temple; R. A. McLean, Ph.D. Purdue; J. W. Philpot, Ph.D. Virginia Polytechnic Institute.

Associate Professors:

H. A. Lasater, Ph.D. Rutgers; R. D. Sanders, Ph.D. Texas; D. J. Wheeler, Ph.D. Southern Methodist; M. S. Younger, Ph.D. Virginia Polytechnic Institute.

Assistant Professors:


THE MASTER'S PROGRAM

The M.S. program in Statistics is designed to provide students a basic foundation in theoretical and applied statistics for meaningful careers as consulting and practicing statisticians. A candidate should possess an undergraduate degree with a strong background in calculus, but no restrictions are imposed regarding the undergraduate major. The typical Master of Science degree program in Statistics is as follows:

Statistics Major Area

Quarter Hours

Probability theory

3

Theory of statistical inference

6

Additional coursework in statistics as approved by the student’s committee

9

Additional coursework as approved by the student’s committee

9

Minor Area

Selected with the approval of both the Department of Statistics and the department in which the work is to be taken

9

Thesis*

9

Total minimum hours

45

MBA CONCENTRATION

For students whose concentration area is Statistics, the MBA Core is revised to substitute Statistics 5110 for 5010. The concentration area must include 5110 and 5130. Normally, Statistics 5250-60-70 are also included which require 3450 as a prerequisite.

Statistics courses numbered 4000 and above provide the basic familiarity with the basic probability distributions in statistics and with the general concepts of statistical estimation and hypothesis testing. Students unfamiliar with these concepts should seek advice from a statistics advisor concerning prerequisite course work.

3450 Statistics for Engineering (3) Survey of statistical methods with special application for engineering students; frequency distributions, selected sampling distributions, some tests of significance. Cannot be taken for credit concurrently with 2100. Prereq: Mathematics 2840.

4250 Nonparametric Methods (3) Measures of association, two-sample tests, analysis of variance with ranked data, paired and multiple comparisons in preference testing; questionnaire evaluation. Prereq: 3450.

4310 Regression Analysis (3) Linear regression and correlation, multiple regression, stepwise methods, polynomial regression, use of dummy variables. Use of standard regression computer programs. Elementary theory and applications. E

4410 Design of Experiments (3) Principles and procedures for efficient experimental design. Randomization, choice of size and number of experimental units, utilization of blocking arrangements. Interpretation of experimental data. W, Su

4415 Sampling Techniques and Theory (3) Procedures used in probability sampling for a variety of arrangements of statistical universes and development of estimators and standard errors associated with the sampling schemes. Some properties of estimators. Determination of sample size. Not available for credit to students with credit for 3410. F, W, Sp

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5010 Probability and Statistical Inference (3) Fundamentals of probability, discrete and continuous probability models, mathematical expectation, and inference concerning means. Prereq: Mathematics 5052 or equivalent and a computer programming course. May not be taken for credit by students who receive credit for 5110. F, W

5020 Statistical Methods (3) Regression and correlation models, basic time series analysis and forecasting; inferences about one or more proportions, and tests for independence. Prereq: 5010. W, Sp


5110 Introduction to Probability Theory (3) Classical probability and distribution theory. Prereq: Elementary linear algebra and calculus of several variables. F

5120-30 Theory of Statistical Inference (3, 3) Introductory theory underlying common statistical procedures of hypothesis testing and estimation. Prereq: 5110. W, Sp


5211 Elementary Statistics (3) Introductory statistics for graduate students. Probability, sampling distributions, estimation, and hypothesis testing. Emphasis on interpretation and decision making. Not available for credit in any College of Business Administration degree program. F, Su


5610 Special Topics in Statistics (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5680 Applied Multivariate Analysis (3) Canonical correlation; discriminant analysis for several groups, and for equal and unequal covariance matrices; principal component analysis; Hotelling's T², multivariate analysis of variance and covariance. Prereq: 1 yr applied statistics including analysis of variance and multiple regression analysis. W

6070 Factor Analysis (3) Principal component analysis and principal factor analysis; estimates of communalities; methods of rotation; interpretation of factors; cluster analysis. Prereq: 5680. Sp

6210 Stochastic Processes II (3) Special analysis, time series, linear and nonlinear systems. Prereq: 5210.
The College of Communications offers two graduate degrees with a major in Communications, the Master of Science (M.S.) degree and the Doctor of Philosophy (Ph.D.) degree.

In addition, Communications is available as a minor for students majoring in other departments. Required course work will be selected after discussion with the major advisor and an advisor from the College of Communications.

The M.S. program (professional track) is accredited by the American Council on Education for Journalism. The College is a member of the American Association of Schools and Departments of Journalism and the Broadcast Education Association.

The doctoral program in Communications is listed in the Academic Common Market of the Southern Regional Education Board. Students residing in Alabama, Georgia, Kentucky, South Carolina, Virginia, and West Virginia can normally qualify for in-state fee status by applying to the Academic Common Market coordinators in their state capitals.

**MASTER OF SCIENCE**

The Master of Science degree with a major in Communications is offered for students who primarily desire (1) advanced preparation in effective communication for mass media and other fields of applied communications, or (2) a deeper understanding of the communication process and the social role of the mass media. The prospective student who is interested in acquiring basic skills in journalism, advertising, or broadcasting is advised to consider a second baccalaureate rather than an advanced degree. (Note: There is no M.S. in Journalism or Advertising or Broadcasting at this institution. Students desiring a major in one of these fields must take the B.S. program.)

Applications must meet admission requirements of The Graduate School. In addition, they must complete the Graduate Record Examination, the California Psychological Inventory, and application forms as required by the College of Communications. All application materials will be screened by an admissions committee authorized by the Graduate Studies Committee of the College of Communications.

New students may be admitted to the program at any time; however, beginning enrollment is limited to the summer and fall quarters each year. Unless necessary materials are received at least six weeks before registration, applications may not be processed in time for admission to full potential candidate status in the first quarter. In these cases, the student may still qualify for non-degree or provisional status.

The student may choose either of two tracks, both leading to the M.S. in Communications and both requiring a thesis:

- **The academic track** is designed for the student who wishes to emphasize advanced study of the theory and effects of communications. A minimum of 45 hours of approved graduate work is required:
  - 12 hours of core courses:
    - Communications 5100, 5120, 5140 and 6100, the first three of which must be taken during the first two quarters of the student’s program, except with written approval of the Assistant Dean for Graduate Studies for the College.
    - In addition, students who earned their Bachelor’s degrees outside the field of Communications will normally be required to add Communications 5130 to their core;
  - 24 hours of selected courses within the College, including at least 9 hours at the 5000 level;
  - 9 hours of thesis work (Communications 5000).

- **The professional track** is designed for the student who desires the graduate degree but wishes to emphasize a particular professional area, such as advertising, broadcasting, journalism, or public relations. A minimum of 45 hours of approved graduate course work is required:
  - 9 hours of core courses:
    - Communications 5100, 5120 and 5140, which must be taken during the first two quarters of the student’s program, except with written approval of the Assistant Dean for Graduate Studies for the College;
  - 15 hours in a major area within the College, including at least 6 hours at the 5000 level;
  - 9 hours of thesis work (Communications 5000);
  - at least 12 hours in a minor area approved by the major advisor, of which at least 6 hours must be at the 5000 level.

In addition, students with Bachelor’s degrees in other cognate areas will be required to complete prerequisites as designated by their advisors. Advising for the professional track will be supervised by the chairperson of the appropriate department of the College. Students who have had no courses in their major areas of concentration may expect to spend six or more full-time quarters in the program.

After the formal program of courses and research in either track is completed, the student must pass an oral examination conducted by his/her graduate committee.

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

**DOCTOR OF PHILOSOPHY**

The Ph.D. degree with a major in Communications is intended to prepare scholars for teaching, research, administration, and service in the field of human communications. The program is interdisciplinary, consisting of a required core curriculum and recommended emphasis outside the College in the related social and behavioral sciences.
The program is flexible and will accommodate full-time study beyond the Bachelor's degree. Students lacking academic or professional work 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.

The following are normally minimal requirements for admission to full potential candidate status: (a) 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; (b) above the fifteenth percentile in verbal and quantitative aptitude on the Graduate Record Examination; (c) completion of the California Psychological Inventory; (d) endorsement by at least three former teachers or professional colleagues chosen by the Ph.D. Admissions Committee; (e) a statement of the applicant's goals and reasons for pursuing the doctorate. Personal interviews with members of the Ph.D. Admissions Committee may be required. Professional experience in some field of communications is a highly desirable criterion for admission.

The following program represents work normally required for an individual with only the Bachelor's degree and no technical competence: (a) prerequisite courses offered by the College of Communications and approved by the major advisor for applicants lacking the necessary academic and/or professional background; (b) core curriculum: 33 hours of course work; (c) primary concentration in communications: 15-18 hours of course work; (d) secondary concentration in a cognate minor subject normally outside communications: 12 hours of course work; (e) technical competence area in either teaching, research, or administration: 15-18 hours of course work and, for those who lack appropriate professional experience, an internship equivalent of 9 credit hours; (f) research tool: 12 hours of course work, e.g., statistics, foreign language, or computer science; (g) dissertation: 36 hours of Communications 6000.

The following courses represent the required core curriculum (beyond the Bachelor's degree). Communications 5100, 5120, 5140, 6100, 6200. One of the following: Communications 6300, 6310, 6320. For the teaching or administrative technical competence area: a one-week, non-credit computer program course and Statistics 5211, or Sociology 5320 and Statistics 4250; for the research technical competence area: Statistics 5010 and 5020.

Continuing and Higher Education 5450. Two courses in organizational theory from a group approved by the Graduate Studies Committee. Admission to candidacy must be attained at least one quarter before graduation and requires successful completion of a comprehensive examination.

REQUIRED SCHOLASTIC AVERAGE
A student in the College of Communications whose graduate grade point average, not including incomplete grades, is below 3.0 at any time after the end of 12 hours of graduate credit will be placed on probation. A student on probation will be dropped from the program unless his or her cumulative graduate grade point average is 3.0 or higher at the end of the probationary period. The probationary period is defined as the next 12 quarter hours of graduate course work attempted which is specified in the student's degree program. Exceptions to this policy may be made only with the approval of the Assistant Dean for Graduate Studies of the College of Communications upon the recommendation of the student's faculty committee.

Communications Research Center

The Communications Research Center is a vital adjunct to the communications graduate program. Objectives of the Center are: (a) to conduct original research in the fields of mass and public communication; (b) to disseminate research-generated information; and (c) to provide research services to faculty and students, professional communicators, and others interested in improving the quality of human communications.

Department of Instruction

Planned course offerings in the College of Communications for the current academic year are published in the College newsletter the preceding November. This information is available from the Dean's Office, 302 Communications Building, 974-3031.

Communications

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

Professors:

Associate Professors:
G. A. Everett, Ph.D. Iowa; M. W. Singley, Ph.D. Southern Illinois.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5100 Introduction to Graduate Studies (3) Scope and methods of advanced study in communications. Information sources, literature review methods, scholarly thesis, style and degree requirements and procedure, overview of traditional and behavioral research methods. Su, F.

5120 Research Methods (3) Communications research, strategy and methodology. Scientific process, bases for derivation and verification of hypotheses, and basic methods of designing research in communications. Su, F.

5130 Advanced Principles of Mass Communications (3) Proseminar course in all phases of mass communications including history, development and current status of communication industry, principles of mass communications, and principles of advertising.


5150 Seminar in Communications Issues (3) Contemporary topics in communications. Prereq: 5100 and 5140, or consent of instructor. May be repeated. Maximum 6 hrs.

5700 Independent Study (3) Reading, research, or projects on special topics in communication. On individual basis, under faculty direction, with consent. May be repeated.

6000 Doctoral Research and Dissertation (3-15) E

6100 Seminar in Communications Theory (3) Intensive analysis of selected theories and supporting research data dealing with source, message, media, receiver, or situational variables in process of communication. Prereq: 5140.

6200 Seminar in Communication Topics (3) Identification, presentation and analysis of special issues and problems in communication. Organization and strategy in writing research proposals. Prereq: 5100, 5120, 5140. Recommended prereq: 6100 or consent of instructor.

6300 Survey Research Methods in Communications (3) Survey research methods applied to opinion and communications media research problems. Planning, sampling, questionnaire construction, data gathering (personal, mail, and telephone), data processing and interpretation. Attitude measurement and message pretesting applications. Prereq: 5120 or consent of instructor. Prereq or coreq: Basic statistics.

6320 Seminar in Historical Research Methods in Communications (3) Materials and methods in historical, descriptive, and legal research in communications theory and behavior. Prereq: 5100, 5120. Recommended prereq: 5140, 6100. Su

Advertising

Professors:
R. Joel (Head), M.A. Wisconsin; A. D. Fletcher, Ph.D. Illinois; D. G. Iseman, Ph.D. Illinois.

Assistant Professor:

3630 Advertising Copy and Layout (4) Ideas and their translation into persuasive words and pictures. Principles and techniques of copy and layout. Lecture and labs. Prereq: 3000 with grade of "C" or better or consent of instructor. F, W, Sp

4000 Advanced Advertising Copy and Layout (4) Creative strategy and execution of advertisements for mass media. Problems in idea creation for advertisers. Lectures and labs. Prereq: 3630 with grade of "C" or better or consent of instructor. F, W, Sp

4360 Advertising Media (3) Media, markets, and audiences. Evaluation of media in relationship to communication needs of advertisers. Prereq: 3000 with grade of "C" or better or consent of instructor. E

4460 Cases and Problems (3) The case approach to the study of advertising problems. Analysis of campaigns and trends. Prereq: 3630, 3650 and 4360 with grade of "C" or better or consent of instructor. F, W, Sp

4470 Advertising Campaigns (4) Application of theory in planning and execution of campaigns. Market research, consumer information, communication and allocation of budgets. Choice of appeals and

College of Communications
approaches; media selection; preparation of advertise-
ment copy. Prereq: 3650, 4000 and 4360 with grade of "C" or better or consent of instructor. F, W, Sp.

5310 Current Issues in Advertising (3) Current socioeconomic, legal, ethical, and cultural issues in advertising and communication to determine adver-
tising's role in society and responsibility toward society. Emphasis on both marketing and behavioral science aspects of advertising. Consideration of creativity, media selection, market research. Extensive indi-
vidual reading; preparation and delivery of papers.

5350 Advanced Advertising Research (3) Nature, scope, and application of research including measurement of advertising, media audiences, and evaluation of messages. Prereq: 4460 or consent of instructor.

5510 Creative Projects (3) Creative or problem solving interests related to advertising. Designed for the advanced student who wishes to apply theory and skills to specific problems. Prereq: 4000 and 4460 or consent of instructor. May be repeated.

5970 Independent Study (3) E

Broadcasting

Professors: D. W. Holt (Head), Ph.D. Northwestern; H. H. Howard, Ph.D. Ohio.

Associate Professor: R. M. S. Bureau.

Assistant Professors: F. A. Lester, M.A. Tennessee; B. A. Moore, Ph.D. Ohio; R. A. Shirley, M.A. Tennessee; M. K. Sidel, Ph.D. Ohio.


3360 Television and Radio Advertising (3) Princi-
iples of successful radio-television advertising; emphasis on media research, rate structure, pro-
gramming, creativity; television commercials. W, Sp.


4010 Speech for Broadcasting (3) Fundamental broadcast conditions affecting the announcer; pronun-
ciation and oral interpretation of general Ameri-
can speech. Spanish, Italian, German, and French pronunciation. Prereq: Speech 2511. F, W.

4020 Radio Production (3) Study of radio produc-
tions, past and present. Familiarization with produc-
tion methods and techniques. Group and individual pro-
duction activities. Prereq: 2750 or consent of instruc-
tor. Cannot be taken for graduate credit by communi-
cations majors. E

4030 Television Production (3) Overview of ele-
ments of television production: cameras, sound, light-
ing, film, videotape recording, optics, and studio control centers. Presented with the layperson and professional broadcast student in mind. Prereq: 4020 or consent of instructor. Cannot be taken for graduate credit by communications majors. E

4040 Advanced Television Production (3) A semi-
independent course in program origination, produc-
ing, directing and performing with orientation to the professional broadcast student. Prereq: 4030 or consent of instructor. E

4610 Broadcast News Operation (3) Theory and practice in covering local news and public affairs events for radio and television. Gathering and pro-
duction of news broadcasts, using tools of broadcast

broadcasters. Prereq: 2750 or consent of instructor. F, Sp, Su.

4660 Broadcast Sales Management (3) Problems and practices of television and radio sales. Case studies in sales development, pricing, promotion, and other areas of sales management. Prereq: 2750 or consent of instructor. Sp.

5410 Educational Broadcasting (3) Summary, analysis, application, and evaluation of television and radio broadcasting for educational purposes. Sp.

5510 Creative Projects (3) For students having spe-
cialized broadcasting interests or those who wish ex-
tensive directed study in creative writing or produc-
tion projects. May be repeated. E

5610 Public Affairs Broadcasting (3) News and public affairs function in broadcasting stations and networks, including management, economics, per-
sonnel utilization, sources of program materials, ethical and legal aspects. Public affairs program de-
velopment, particularly press conferences, inter-
views, and news specials. Prereq: 3610 or consent of instructor. W.

5620 Broadcast Law and Regulations (3) Sociopo-
tical control of broadcasting; effect of laws, regula-
tions, and public pressures upon station policies. Emphasis on unique situation of broadcasting among media in terms of regulation. Prereq: Journal-
ism 4410 or 5210 or consent of instructor. F.

5630 Broadcast Documentary Writing (3) Role of the documentary in radio and television. Research, writ-
ing, and critique of documentary programs. Sp.

5560 Radio-Television Program Development (3) Planning basic program structures for broadcasting stations. Historical trends in programming and cur-net programming practices as related to audience requirements, governmental policy, and competitive conditions. Individual studies of program develop-
ment on both local station and network levels. Prereq: 2750 or consent of instructor. S, F.

5970 Independent Study (3) E

School of Journalism

Professors: J. A. Crook (Director), Ph.D. Iowa State; J. B. Haskins, Ph.D. Minnesota; B. K. Leiter, Ph.D. Southern Illinois; D. D. Nimmo, Ph.D. Vanderbilt.

Associate Professors: J. N. Ackerman, M.A. University of Tennessee; P. G. Ashdown, Ph.D. Bowling Green, B. J. Battman, M.A. New York; G. A. Everhart, Ph.D. Iowa; M. W. Sibley, Ph.D. Southern Illinois; F. B. Thornsburg, M.A. Florida.

3120 Writing Feature Articles (3) Selection of topics and practice in writing feature articles for newspapers, magazines, and company publications. Prereq: 2220 or consent of instructor. E

3410 Communications Law (3) Statutory law and judicial precedents affecting mass communications media. Libel, contempt of court, invasion of privacy, copyright. Broadcasting, advertising and postal regu-
lations. F

3710 Public Relations (3) Theories and principles of public relations. Overview of PR as a management tool of business, government, institutions, and or-
ganizations. Cannot be taken for graduate credit by communications majors. E

3720 Advanced Public Relations (3) Preparation of communications materials to gain support from va-
rious publics; planning public relations programs. Prereq: 3710. F, Sp.

3810 Specialized Publications (3) Editorial and de-
sign considerations for company publications and small magazines. Prereq: 2230 and 3310 or consent of instructor. W, Sp.

3990 Journalism Research Methods (3) Use of so-
cial science research methods in journalism with emphasis on research design, interpretation and communication of research findings. W, Sp, Su.

4130 Editorial Writing (3) Analysis of editorial poli-
cies, practices, pages. Writing of editorials and col-
umns with emphasis on study and use of rhetorical devices and logic. Sp.

4150 Issues in Journalism (3) Topics vary. May be repeated. Maximum 6 hrs.

4310 Reporting Public Affairs (3) Reporting news of courts, politics, and government. State, county and local coverage. Prereq: 2230 and senior stand-
ing. W, Sp.

4410 Mass Media and Society (3) Roles and re-
 sponsibilities of mass media in society. Critique of mass media performance. Media codes and controls on the media. E.


4580 Investigative Reporting (3) Investigative and interpretative reporting of complex or specialized sub-
djects to place news in perspective or to clarify situa-
tions. Emphasis on writing for publication. Prereq: 2220. W.

4710 Public Relations Cases (3) Case studies and application of public relations principles to problems in business and industry, government, institutions, trades and professions; solving problems in public relations situations. Prereq: 3710. F.

4810 Journalism in the High School (3) Functions and methods of high school publications. Staff orga-
nization, writing and editing techniques, editorial problems, and business management. Sp.

4910 News and Feature Photography (3) Ad-
vanced principles and methods in black-and-white

photography. Emphasis on news and feature photo-
graphs, and picture stories. Prereq: 3910 or consent of instructor.

4950 International Communications (3) Com-
munication of news and opinion among nations and

under varying types of political and economic systems; world news organizations; the press as a fact
or in international affairs; barriers to the flow of information; comparison of world press systems.

4970 Independent Study (3) May be repeated. Maximum 6 hrs.

5210 Government and the Press (3) Historic and current problems in the relations of executive, judi-
cial, legislative, and regulatory segments of gov-
ernmental and press. Prereq: 3110 or consent of in-
structor. W.

5250 Public Opinion and Mass Media (3) Nature of public opinion with emphasis on role of press in its form and how the press is turned is influenced by public opinion. Prereq: 4410 or consent of instructor.

5510-20-30 Writing and Editing Projects (3, 3, 3) Specialized writing or editing interests, such as agricul-
ture, politics, labor, finance, science, as technical as well as general publications. Prereq: 2220 or 2230.

5560 Magazine Article Writing (3) Techniques of writing in-depth articles for mass circulation maga-
azines. Organizing and presenting material. Problems in specialized areas, such as business, science, agriculture, the humanities. Prereq: 3120 or consent of instructor. Sp.

5710 Studies in Public Relations Communica-
tions (3) Problems of communication between in-
stitutions and organizations and their publics. Case histories and evaluations of programs. Prereq: 3710 or consent of instructor.

5810 Magazine Editing and Production (3) Anal-
sis of editorial and production problems of general, regional, and specialized publications. Reader in-
tended evaluation. Individual editorial projects. Prereq: Consent of instructor. F.
5950 Communications and International Development (3) Seminar emphasizing mass media in national and international development. Communications and change in developing countries. Problems in international and cross-cultural communications. Prereq: 4950 or consent of instructor.

5970 Independent Study (3)
The College of Education offers programs of advanced study leading to the Doctor of Education degree in the major areas listed on page 8, and to the Doctor of Philosophy degree in Health Education.

The Ph.D. program with a major in Education provides five options for study in the departments of Curriculum and Instruction, Educational Administration and Supervision, Educational and Counseling Psychology, Physical Education, and Vocational-Technical Education. The program requirements and the options and emphases are:

### The Program

#### Research Area
- Educational Psychology and Guidance, in Curriculum and Instruction, in Safety Education and Service, or in Vocational-Technical Education.

#### DOCTORAL DEGREES

### Options and Emphases

**Option I. Administrative Theory and Practice**
- The Administration of Higher Education
- Contemporary Economics and Educational Finance
- Educational Planning
- Facility Planning
- Maintenance of School Plants
- Organizational Theory
- Personnel Administration
- The Politics of Education
- The Principalship
- School Law
- The Superintendency
- Supervision

**Option II. Theories of Curriculum**
- Development and Foundations of Education
- Anthropological, Historical, Philosophical, and Sociological Bases for Educational Planning and Curriculum
- Principles and Models for Planning, Developing, and Evaluating Educational Programs
- Research Design for Educational Programs

**Option III. Instructional Theory and Practice**
- Principles and Models for Instructional Improvement
- Subject Areas of Instruction and Practice (e.g., English, Foreign Languages, Mathematics, Science, Social Studies, etc.)
- Elementary and Early Childhood Instruction and Practice
- Learning Media Services
- Physical Education Instruction and Practice
- Adapted Physical Education
- Vocational-Technical Fields of Instruction and Practice

**Option IV. Theories and Practice of Educational and Personal Adjustment**
- Assessment (Educational, Vocational, Personality)
- Behavioral Interventions

### Hours and Requirements

- **Minimum**
  - 9 Hours
  - 36 Hours
  - 9 Hours

- **Dissertation**
  - 36 Hours

- **Cognate**
  - A minimum of 9

- **Supporting Emphasis**
  - A minimum of 12 hours selected from options.

- **Major Option**
  - A minimum of 24 hours normally selected from one or two emphases within the major option.

- **Trans-college seminar**
  - Four consecutive quarters

- **Specialization**
  - Four consecutive quarters

- **General Core Requirements**
  - Six hours

- **Courses in learning theory, curriculum theory, and administrative theory**
  - Nine hours

- **Courses in history of education, philosophy of education (two areas must be represented)**
  - Minimum

- **Courses in teaching learning and curriculum theory, and administrative theory (three areas must be represented)**
  - Minimum

The faculty of the College of Education is committed to performing three major functions: (1) to provide professional preparation for teachers, administrators, school service personnel, and selected other professionals such as health and recreation personnel at the undergraduate and graduate levels; (2) to collaborate with school personnel, educational agencies, professional groups, and others interested in the evaluation and improvement of educational opportunities, programs, and services; and (3) to promote and conduct research and development in education and other areas of responsibility.

The College of Education holds membership in the American Association of Colleges for Teacher Education. All certification and degree programs through the doctoral level are fully accredited by the National Council for Accreditation of Teacher Education, the Southern Association of Colleges and Schools, and the Tennessee State Department of Education.

The College of Education, through the Graduate School, offers programs leading to the Master of Arts in College Teaching, the Master of Science degree, the Specialist in Education degree, the Doctor of Education, and the Doctor of Philosophy degrees.

**Master of Science**

On the Master's level professional study may be planned (1) in one of the areas listed on page 8, (2) in appropriate combinations of these areas, or (3) in combinations of one or more of these areas with appropriate subjects or areas in other colleges.

**Specialist in Education Degree**

This degree may be earned in Educational Administration and Supervision, in
Career Development
Cognitive and Motor Learning
Consultation for the Helping Professions
Counseling Theory, Research, and Practice
Diagnosis and Remediation of Cognitive and Motor Learning and Behavioral Problems
Educational Measurement and Research Design
Ethnic and Sex Fairness in Counseling
Group Processes
Human Development
Learning Theory and Application
Psychological Interventions in School and Community Settings
Student Personnel Work
Training and Supervision of Counselors

Option V. Foundations of Human Movement
Factors Influencing the Learning of Motor Skills
Philosophical and Sociological Foundations of Sport and Physical Education
Physiological Factors Related to Fitness and Performance

Bureau of Educational Research and Service

Four major types of activities—research, development, educational services, and publications—are channeled through the Bureau of Educational Research and Service (BERS), located in Claxton Education Building. The research activities relate to the development of research proposals, conducting research, and assisting others in development of research proposals in the College of Education. Developmental activities relate to change efforts in curricular content and instrumental methodology. Educational services include a wide list of activities such as in-service educational programs, consultant services, and administrative training programs. Official publications of the College of Education are developed through the Bureau. A limited number of graduate student assistantships are available.

Departments of Instruction

Art and Music Education

C. H. Ball, Head

Art Education

MAJOR
Art Education

DEGREE
M.S.

Professor:

Associate Professor:

Assistant Professors:

The Master of Science degree in Art Education is offered for art teachers, supervisors, and art-trained personnel holding the Bachelor's degree. The program provides both thesis and non-thesis options. Moreover, it is possible to achieve Tennessee Certification in art while pursuing the Master's degree program. The thesis option requires 45 quarter hours as follows:

Quarter hours
1. Art Education 5310, 5320 and electives.................................................. 18
2. Education Curriculum and Instruction 5710, and electives.............................. 9
3. Minor (selected with committee).................................................. 9
4. Thesis (Art Education 5000).................................................. 9

The thesis option requires satisfactory completion of an oral examination prior to awarding the degree, while the non-thesis option requires satisfactory completion of a final written comprehensive examination. Both the oral and written exams are conducted by the student's Master's degree committee.

Not all courses in art education are offered regularly each quarter, so the student should plan his or her program carefully with a faculty advisor.

5310 Art in the Secondary School Program (3) Program planning: materials and equipment; relation to other school experiences. Classroom observation. Prereq: 9 hrs art education. 1 hr and 2 labs. F, Sp

5320 Art in Education (3) Historical background, function of aesthetic behavior in visual arts; relationships to psychology, sociology, and anthropology. Prereq: Consent of instructor. E

Music Education

MAJOR
Music Education

DEGREE
M.S.

Professors:

Associate Professors:

Thesis and non-thesis programs lead to the Master of Science degree in music education. Prerequisite preparation: undergraduate degree or equivalent in music education. All graduate students in music education must pass proficiency examinations in music theory and applied music. Requirements for thesis program: 45 quarter hours including thesis (9 hours), the music education major (18 hours), minor areas in music (9 hours), and professional education (9 hours). Required courses: Music Education 5000, 5210, 5220, 5230; Curriculum and Instruction 5710.

Requirements for non-thesis option:
1. Minimum of 51 quarter hours of course work with a minimum of 26 hours at the 5000 level.
2. Evidence of ability to understand and interpret research through completion of:
   a. Curriculum and Instruction 5610 or equivalent.
   b. Music Education 5710.
   c. Satisfactory performance of research activities in required courses in music education listed below.
3. Curriculum:
   a. A major: at least 27 quarter hours in music education.
   b. A minor: at least 15 quarter hours in music.
   c. 9 quarter hours in professional education, including Curriculum and Instruction 5610 and Educational Psychology 4760 or equivalents and a 3-hour elective.

With the exception of the required courses listed and with approval of the student's advisor, courses may be selected as described more fully above. This provides the flexibility necessary for the student to pursue in some depth specialized interests and needs in the following areas of music teaching: Elementary; Secondary (Junior and Senior High); Vocal (Choral); Instrumental (Band and Orchestra); and Supervision.

4. Specific course requirements:
   a. Music Education Foundation (15 quarter hours) including: One seminar (3 hours), 5210, 5240, 5250, 5710.
   b. Music: Six quarter hours in applied music (piano, voice; a band or orchestra instrument; or theory and composition).
   c. Education (limited elective of 6 quarter hours): Educational Psychology 4760 or 5050, 5320, or other appropriate course in

College of Education 50
educational psychology with 3 hours credit.
5. Electives (with approval of advisor):
a. Music Education: 12 credit hours from courses numbered 3000, 4000, or 5000 levels. No courses required in the undergraduate curricula may be included.
b. Education: 3 credit hours, elected from other departments in Education.
6. Evaluation (in addition to routine examinations in courses):
a. Written comprehensive examination in major and minor fields.
b. The student shall elect one of the evaluation procedures below (with approval of advisor and committee):
   (1) Oral examinations in major and minor fields.
   (2) A public recital in principal instrument, piano, or voice.
   (3) The presentation in public performance of an original musical composition(s) accepted by the committee as music suitable for school music performing groups.
(4) Plan, rehearse and conduct a public performance of music by junior or senior high school music groups. This shall be worked out as a long-term project under the supervision of the student's Committee.
7. Student's Committee: A minimum of three faculty members—the advisor from music education, one member from music; one member from education.
4441-42-43 Teaching Class Piano (1, 1, 1) For majors in music, music education, or elementary education. Prereq: Consent of instructor. F, W, Sp.
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any semester in which a 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
5220 The Administration and Supervision of School Music (3) Improvement of teacher-learning, child-learning process in music education. Problems of supervision, research, and in-service education; teacher preparation, and guidance.
5230 Comparative Teaching Procedures in Music Education (3) Modern teaching theories and their implications.
5250 The Role of Music in Education (3) For school personnel, other than music teachers, on the role of music in public education. No previous experience in music required. Su.
5260 Music for Early Childhood (3) Prereq: 3120 or 3130 or consent of instructor. W.
5270 Studies of Music for Children in the Primary Grades (3) Children's growth processes in music for Grades 1-3, and musical experiences. For major in music education and/or elementary education. Prereq: 3120 and 3130 or consent of instructor. Su.
5280 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores suitable for school, college, church, and community bands; emphasis on contemporary and standard major choral works. Prereq: Undergraduate degree with a major in music or music education; 4450, 4510 or equivalent.
5300-60-70: Special Problems in Music Education (3, 3, 3) Current problems in music education at all levels of instruction and in various specialized areas of music curriculum. Prereq: 5710 or equivalent and consent of instructor. E.
5400 Advanced Band Literature and Conducting (3) Reading, conducting, and interpreting band scores suitable for school, college, and community bands; emphasis on contemporary and standard band literature. Prereq: Undergraduate degree with a major in music or music education; 4450 or equivalent.
5510-20-30 The Talent Education Program of Shinichi Suzuki (2, 2, 2) Study of the psychology, procedures and literature utilized by Shinichi Suzuki in Talent Education program in Japan; Prereq: Consent of instructor. F, W, Sp.
5710 Research in Music Education (3) Prereq: Consent of instructor. Su.
5810 Seminar (3) Music teaching in primary and intermediate grades. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. E.
5820 Seminar (3) Music teaching in vocal and general music areas of junior high school curriculum. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. F.
5830 Seminar (3) Music teaching in instrumental areas of the elementary, junior high, and senior high curricula. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. E.
5840 Seminar (3) Music teaching in vocal, theoretic-al, historical, and appreciation area of the secondary school curriculum. Survey of research, professional literature and development of bibliography. Laboratory activities. Projects. Prereq: Admission to M.S. program. E.
5900 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5910 Seminar in Adult Education (3) Employment office, personnel services. Prereq: 4454 or equivalent. Su.
5920 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5930 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5940 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5950 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5960 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5970 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5980 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
5990 Seminar in Adult Education (3) Problems, procedures, and techniques. Additional hours may be included. Su.
Continuing and Higher Education
MAJOR
College of Education 51
DEGREE
Adult Education
College Student Personnel
M.S.
M.S.
Professors:
M. C. Farnsworth, Jr. (Head), Ph.D. Florida State;
Associate Professor:
K. O. McCullough, Ph.D. Florida State.
Assistant Professor:
The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community specialists. The degree program has two options: a thesis option requiring a minimum of 45 hours, and a non-thesis option requiring a minimum of 51 hours. Each student must complete 9 hours in the behavioral sciences. The Master of Science degree in College Student Personnel 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 60 hours, which includes 9 hours of practicum experience, is required in either option. For further information write the Department of Continuing and Higher Education.
4554-55-56 Student Leadership Workshops (1, 1, 1) Small group and individualized experiences to develop knowledge and skills in leadership roles; for resident assistants, student government leaders, student activities, other student organizations. Prereq: Consent of instructor. S/NC only.
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any semester in which a 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.
5060 Adult Education: A General Survey (3) Historical development, philosophies of adult education, agencies, programs, current issues, and literature of adult education. F.
5110 Seminar in College Teaching (3) Effective college teaching, testing and measurement; recent research in college instruction; major problems and issues in higher education. Required of candidates for the M.A.T degree. S/NC only. Sp.
5360-70-80 Problems in Continuing and Higher Education (1-3, 1-3, 1-3) Independent study of problems and special institutes. S/NC only. E.
5410 College and University Law—The Legal Environment (3) Legal precedent affecting organizations, administration, and financing of public higher education. Academic freedom, faculty termination, taxation, private support, religion, tort liability, administrative law, academic due process, and affirmative action in employment. W.
5420 College and University Law—Constitutional Rights and Responsibilities of Students (3) Legal precedent affecting the legal rights and responsibilities of students in public higher education. Student discipline, housing, dress, organizations, activities, fees, tuition, and related federal regulations. W.
5430 College and University Law—Tort Liability and Risk Management (3) Legal precedent concerning liability exposure of public institutions of higher education. Personal and institutional liability. Basic principles of risk management and liability insurance. Prereq: 5410 and 5420, or consent of instructor. E.
5450 Instruction in Higher Education (3) Problems, procedures, and techniques. W.
5460 Adult Development (3) Changes in characteristics of the adult over the life span and implications for adult education. F.
5470 The Curriculum of Undergraduate Higher Education (3) Background, content, and organization of instructional programs, trends and evaluation procedures, including accreditation activities. W.
5510 Governance of Colleges and Universities (3) Development, change, trends, process, and structure of collegiate governance. F.

5600 Program Planning in Continuing and Higher Education (3) Theory and method for planning adult education programs. W

5750 Student Personnel in Higher Education (3) Philosophy and organization of university student personnel services. Sp.

5770 Case Studies in College Student Personnel (3) Prereq: 5750 or consent of instructor.

5860 The Community-Junior College (3) History and role of two-year college, major functions, organization and administration, problems, and issues. E

5955-65-75 Practicum in Continuing and Higher Education (1-3, 1-3, 1-3) Supervised practice in selected areas of instruction or administration of continuing or higher education programs. S/NC only. E

5960-70-80 Seminar in Continuing and Higher Education (1-3, 1-3, 1-3) Problems and issues confronting professionals in fields of adult or higher education. E

5990 Practicum in College Student Personnel (3) Prereq: 5750, 5770, Educational Psychology 5560, or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs.

6450 Advanced Seminar in Program Planning (3) Concepts and theories related to program planning in continuing and higher education. Prereq: 5660 or equivalent.

See also course listings under the Departments of Curriculum and Instruction, Educational Administration, and Supervision and Educational and Counseling Psychology.

Curriculum and Instruction

MAJORS

DEGREES

Curriculum

M.S.

Curriculum and Instruction

Ed.S., Ed.D.

Elementary Education

M.S.

English Education

M.S.

Foreign Language Education

M.S.

Instructional Media and Technology

M.S.

Mathematics Education

M.S.

Reading Education

M.S.

Science Education

M.S.

Social Science Education

M.S.

Education

Ed.D.

Professors:


Associate Professors:


Assistant Professors:


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

THE MASTER'S PROGRAM

For the Master of Science degree, thesis and non-thesis options are available in the following majors: Curriculum, Elementary Education, English Education, Foreign Language Education, Instructional Media and Technology, Mathematics Education, Reading Education, Science Education, Social Science Education. The non-thesis option requires the completion of 51 quarter hours of course work.

THE SPECIALIST PROGRAM

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

THE DOCTORAL PROGRAM

The Ed.D. program in Curriculum and Instruction may include emphasis upon the following fields: curriculum, social foundations, educational research, elementary education, English education, foreign language education, mathematics education, science education, social science education. The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

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

4010 International Education: Europe and the Americas (3) Historical, philosophical, and sociological foundations; special reference to England, USSR, France and Germany.

4150 School Library Administration (3) (Same as Library and Information Science 4150.)

4230 Introduction to Diagnosis and Correction of Classroom Arithmetic Difficulties (3) Classroom strategies for diagnosis and correcting arithmetic difficulties grades 1-8. Prereq: 3350 or 3751 or equivalent.

4240 Classroom Instructional Organization (3) Developing understandings and skills relating to grouping, individualization, space utilization, organization, grading, and pacing; and achieving an effective social environment. For elementary classroom teacher. Prereq: Senior standing.

4300 Developmental Reading in Secondary School and Community College (3) Approaches and materials for teaching basic reading skills and organizing reading classrooms and/or laboratories at middle school, secondary school, and community college level. Prereq: Consent of instructor.

4304 Developing Reading Skills in Content Fields (3) Approaches and techniques for teaching reading skills in content areas of school programs. Emphasis on middle school or secondary school programs. Prereq: Consent of instructor.

4400 Problems in Improvement of Instruction (1-3) Special conferences, workshops, or in-service programs designed for improvement of instruction. May be repeated. Maximum 9 hrs. S/NC only.

4410 Educational Sociology (3) (Same as Sociology 4410.)

4450 Teaching in Kindergarten: Overview (3) Relationship of kindergarten to total elementary program; goals, historical settings and current developments.

4451 Teaching in Kindergarten: Program Development (3) Curriculum planning and organization; classroom management. Prereq; Consent of instructor.

4564 Methods and Materials in Environmental and Science Education (3) Instructional methods, materials, curricular programs and current issues in environmental and science education for classroom teachers. Middle/junior high, senior high school level.

4750 Utilization of Instructional Media (3) Introduces the basic communications process, need for instructional media, instructional development, selection and utilization of media, and basic software production techniques. (Same as Library and Information Science 4740.) 2 hrs and 1 lab.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5040 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.

5070 Seminar in Intercultural Education (3) Analysis of selected problems; political factors in creation of educational policy; social stratification and its bearing on education in elite and mass societies; relation of education to manpower planning and technological change; and others.

5090 Special Topics (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

5091 Independent Study (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

5092 Supervised Readings (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E

5100 History of European Education (3) Education in Western Culture. Prereq; 1 course in history and philosophy of education, or western civilization.

5111-12 History of American Education (3, 3) Changing goals and processes in education. Differing historical interpretations of role of school and relationship to American society. 5111-Colonial through common school movements. 5112-Reconstruction to present.

5120 Principles of Education (3) Philosophic approach to lives and writing of influential educators. Froebel, Rousseau, Pestalozzi, Comenius. Prereq; Consent of instructor.

5140 Comparative Philosophies of Education (3) Educational theory and pedagogical programs of the major philosophic schools of thought. Prereq; Consent of instructor.

5141 Pragmatism in Education (3) Effects of American pragmatic tradition on educational policy and practice. Prereq; At least one course in history or philosophy of education.
5142 The Existential Student (3) Literature of existentialism as a resource for harmonizing student's educational goals and curriculum.

5150-60-70 Seminar (1-3, 1-3) Curriculum, elementary education, secondary education, or social studies as they relate to goals of students' programs. Maximum 9 hrs. S/NC only.

5180-90-200 Seminar Educational Specialist Research and Thesis (3, 3, 3)

5210 Seminar in International Education: Asia and Africa (3) Historical, philosophic, and sociological foundation; special reference to Japan, China, India, and Nigeria.

5211 Instructional Strategies in Elementary School Social Studies (3) Specific teaching methods and instructional procedures for organizing social studies learning. Prereq: Undergraduate social studies course or equivalent.

5212 Programs and Materials in Teaching Elementary School Social Studies (3) Analysis of new and innovative social studies program materials with attention to methods of diversifying teaching, using materials, and to analyses of program structure. Prereq: 3270 or equivalent or consent of instructor.

5220 Advanced Study and Practicum in Diagnosing Elementary School Reading Difficulties (3) Assessment and practicum experience with students having corrective and remedial arithmetic needs. Prereq: Consent of instructor.

5240 Creative Thinking and Expression in the Elementary School (3) Gives students opportunity to examine development of creative potential across academic curriculum of elementary school. Prereq: Consent of instructor. Sp, Su.


5260 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. Prereq: English 2430 or 3610, or equivalents. E.

5261 Educational Classics (3) Selected writings on education from Plato to Dewey.

5270 The Elementary School Curriculum (3) Theoretical background and experimental approaches.

5280 Teaching Language Arts in the Elementary School (3) Trends in methods, materials and content. Not available for credit to persons completing recent elementary language arts methods course. Prereq: 12 hrs in English or related courses or consent of instructor.

5281 Teaching Social Studies in the Elementary School (3) Trends in methods, materials and content. Not available for credit to persons completing recent elementary social studies course. Prereq: 12 hrs in social science or consent of instructor.

5282 Teaching Science in the Elementary School (3) Trends in methods, materials and content. Not available for credit to persons completing recent elementary science methods course. Prereq: 12 hrs in science or consent of instructor.

5283 Programs and Materials in Teaching Elementary Science (3) Analysis of new and innovative science program materials; methods of diversifying teaching, using materials, and analyses of program structure. Prereq: 3270 or equivalent, or consent of instructor.

5284 Seminar in Teaching Elementary Science (3) Analysis of current curricular issues. Prereq: 5282 or 5283 or one year teaching experience, or consent of instructor.


5291 Programs and Materials in Elementary School Language Arts (3) Programs and special instructional aids associated with language arts. Prereq: 3350 or equivalent, or consent of instructor.

5292 Seminar in Research and Theory in Teaching Mathematics in the Elementary School (3) Systematic study of research and theory and their applications to teaching of mathematics. Prereq: 3350 or equivalent, consent of instructor, and 1 yr of teaching experience. Su.

5301 Developmental Reading in the Elementary and Middle School (3) Methods and materials, basic approaches, examination of reading skills, development of functional relationship with other curricular areas. Not available for credit to persons with recent course in reading education. Prereq: Consent of instructor.

5302 Psychology of Reading (3) The reading act, relationship between learning theory and reading, role of reading in child's overall intellectual development. Prereq: Undergraduate reading course or consent of instructor.

5303 Methods and Materials for Teaching Critical Reading (3) Instructional techniques, methods, and materials for development of higher level comprehension skills, concepts, and attitudes for creative (or productive) and critical (or evaluative) reading. Prereq: Course in reading education or consent of instructor.

5304 Programs and Materials for Reading Instruction (3) Examination, selection, and use of materials in reading program, distinguishing between approaches and materials for teaching reading. Prereq: Course in reading education or consent of instructor.

5305 Trends and Issues in Teaching Reading (3) Differentiation of approaches through analysis of past, present, and future programs, materials, and developments. Prereq: Graduate course in reading education or consent of instructor.

5306 Teaching Reading to the Linguistically Different Learner (3) Language characteristics and special reading problems pertaining to linguistically different learner. Prereq: Course in reading education or consent of instructor.

5307 Assessment and Correction of Classroom Language Arts Difficulties (3) Classroom approaches to assessing and correcting language arts (other than reading) difficulties. Prereq: One graduate level course in elementary school language arts or consent of instructor.

5350 Curriculum Development and Evaluation (3) Examination of alternative approaches to improving current practice. Prereq: 5580 or consent of instructor. E.

5355 Curriculum Development at the Local Level (3-9) Systematic approach to planning and development of curriculum at local school or system level. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5365 Mathematics Laboratories in Elementary School (K-9) (3) For elementary school teachers dealing with activity-oriented mathematics laboratory materials and pedagogical strategies. Theoretical considerations and development of curricula and materials for laboratory. Prereq: Consent of instructor. Sp, Su.

5379 Diagnosis and Correction of Classroom Reading Problems (3) Procedures, methodologies and applications. Students may not enroll without consent of instructor. Prereq: Course in reading education or consent of instructor.

5380 Practicum in Diagnosis of Reading Problems (3) Theoretical and practical applications of specific reading diagnostic instruments; testing of elementary and/or secondary school children, preparing case study reports, and conducting parent conferences. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5381 Practicum in Remediation of Reading Problems (3) Application of principles of learning and teaching methodology in working with elementary and/or secondary school students on one-to-one or small group basis. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 6 hrs.

5382 Developmental Reading Practicum (3) Diagnosis and corrective reading needs; Prereq. Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 6 hrs.

5400 Problems in improvement of Instruction (1-3) In-service conferences, workshops, and in-service programs. May be repeated. Maximum 9 hrs. S/NC only.

5410 The High School Curriculum (3) Identification of problems associated with curriculum study, emphasis on Tennessee curriculum framework, assessment of trends in programs of local, regional, and national significance. E.

5510 Educational Statistics (3)

5520 Direction and Supervision of Student Teaching (3) Roles and responsibilities of cooperating teachers and student teachers; objectives and policies of student teaching programs; elements of clinical supervision; overview of research.

5530 Individualization of Instruction (3) Practical experience in designing individualized activities and materials. Prereq: 5580 and 5909 or consent of instructor.

5540 Newer Trends in Elementary Education (3) Trends in classroom procedures, equipment, and materials of instruction; problems involving improvement of instruction. W, Su.

5550 Curriculum Laboratory for Elementary Schools (2-4) Workshops and in-service programs to improve instruction of teachers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5570 Curriculum for Early Childhood (K-3) (3) Sp, Su.

5620 Teacher-Parent-Community Relations (3) Development of techniques for effective relations between parents and teachers. Roles and expectations of parents and teachers, parent involvement, and influence of community on educational process. W.

5630 Design of Instructional Media (3) Design and application of instructional development model to arrive at solutions to instructional media development and design of a learning sequence or module, using appropriate media in actual learning setting. Prereq: 4750 or consent of instructor.

5651 Elements of Sound and Science (3) Learning, internal and external environments, sound preserving, synctaping, photocopying, non-photographic slides, and videotaping for producing class materials. Prereq: consent of instructor, Library and Information Science 4750 or equivalent. (Same as Library and Information Science 4750). Prereq: Consent of instructor.

5652 Evaluation of Instructional Media (3) Evaluating and recycling media prototype to meet needs and objectives of learners. Prereq: 5651 or consent of instructor.

5653 Administering Instructional Media Programs (3) Duties, functions, and responsibilities of media professionals developing and administering
media program in various organizational and learning settings. Prereq: 5691, 5692, or consent of instructor.

5694 Utilization of Educational Television and Radio (3) Use of noncommercial educational TV and radio in schools and colleges. Prereq: Consent of instructor.

5695 Research in Instructional Media (3) Media research and its application toward improvement of instruction and learning. Prereq: Consent of instructor.

5696 Practicum Experience in Instructional Media (3) Practicum experience in professional media role as identified by student in various organizational and learning settings. Prereq: Consent of instructor.

5697 Application of Instructional Media (3) Media theory and research, newer media and technology, application of media in instructional settings. Prereq: Consent of instructor.

5710 Techniques of Research in Education (3) Study and application. Prereq: 1 year teaching experience.

5720 Observation and Analysis of Instruction (3) Classroom observation and analysis procedures; development of objective observation and analysis skills, examination of existing observation systems.

5790 Career Development: Workshop (1-6) (Same as Educational Psychology 5790).

5800 Seminar in Cooperative Curriculum Research (3) Action research procedures and their application to programs. E

5810 Introduction to Data Processing in Education (3) Analysis of current activities in field of educational data processing. Emphasis on curricular, administrative, and research opportunities in education, using modern electronic data processing machines and machines. Prereq: Consent of instructor.

5820 Seminar in the Teaching of Mathematics (3) Current methods and materials for grades 7-12 for experienced teachers. Prereq: 1 year teaching experience (mathematics grades 7-12) or consent of instructor; Sp.

5825 Teaching Mathematics in the Middle and Junior High School (3) Problems related to teaching mathematics in middle and junior high schools. Understanding structure of mathematical concepts, strategies, methods, and materials for teaching. Materials suitable for individualized instruction, mathematical laboratories, and independent study. Opportunities for individual projects. Prereq: Consent of instructor. E

5830 Seminar in Mathematics Education (3) Current curricular issues. Emphasis on individual student projects and investigation. W

5835 Teaching Mathematics in the Senior High School and Community-Junior College (3) Curriculum and teaching problems. Methods of teaching "analysis" courses such as Algebra II, trigonometry, analytic geometry and calculus. Prereq: 3751-52 or equivalent. Su.

5841 Trends and Issues in Early Childhood (3) Historical background; trends, and issues as basis for evaluating current programs; materials and techniques of teaching F, Sp.

5842 Applications of Theory in Early Childhood Education (K-3) (3) Principles and practices from several theoretical orientations for young children (K-3). Teaching strategies, materials and evaluation methods. Prereq: Course in child development or child psychology at senior or graduate level.

5843 Seminar in Early Childhood Education (3) Analysis of research in early childhood education (K-3) with emphasis on application to programs and methods of instruction. Prereq: 4450 or equivalent, or consent of instructor. May be repeated. Maximum 6 hrs. W

5844 Mathematics in Early Childhood Education (K-3) (3) Behavioral characteristics of children in regard to mathematics, content materials and function-al instructional settings, and teaching strategies for development of mathematical ideas. Prereq: 3550 or equivalent. Su.

5845 Social Studies and Science in Early Childhood Education (K-3) (3) Integrative approaches to and substantive classification systems of content areas of social studies and science for early child-hood years. Emphasis on selection of appropriate social studies and science content and approaches for the young child. Prereq: 3270 and 3720 or equivalent, F, Su.

5846 Language Arts in Early Childhood Education (K-3) (3) Language development of young learner with emphasis on teaching methods, procedures, program and materials in early childhood language arts program. Prereq: 3260 or equivalent or consent of instructor.

5899 Field Experience (1-6) Application of curricular and instructional principles, methods, and materials in schools. Program prerequisites must be met, and consent of instructor required. May be repeated. Maximum 12 hrs. S/N only.


5901 Linguistics and the Teacher of English (3) Analysis and application of linguistics in the classroom. Su.

5902 Teaching Composition in the High School (3) Techniques for teaching rhetoric. W

5903 Teaching Fiction in the Secondary School (3) Reading, study, and analysis of literary selections. F


5905 Teaching English in the Community-Junior College (3) Emphasis on thorough understanding of communication needs of community junior college students and objectives, strategies, and materials for meeting these needs. Su.

5906 Teaching Poetry in Grades 7-12 (3) Materials and strategies for teaching poetry. W

5907 Teaching Drama in Grades 7-12 (3) Strategies and materials for teaching drama. W

5908 Developing Speaking and Listening Skills in Grades 7-12 (3) Strategies and materials for teaching skills of speaking and listening. Sp.

5909 Instructional Theory and Design (3) Instructional process and relationship to curriculum and learning. Prereq: Consent of instructor.

5910-20-30 Problems in Lieu of Thesis (3, 3, 3) Topics new to reading and language arts chosen by need and instructor(s). Prereq: 5500-level course in reading and in language arts or consent of instructor. Su.

5920 Seminar in Philosophy of Education (3) Topics new to teaching and philosophy chosen by need and instructor(s). Prereq: 5500-level course in reading and in language arts or consent of instructor. Su.

5940 Seminar in Curriculum and Instruction (1) Required three quarters. S/N only. E

5950 Advanced Studies in Elementary Education (3) Critical analysis of research as it applies to classroom practice. Prereq: 5710 or 5800; 12 hrs at graduate level; or consent of instructor. W.

5960 Advanced Seminar in Philosophy of Education (3) Some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.

5981 Phenomenology and Education (3) Theory and applications to selective educational issues. Prereq: 2 courses in history or philosophy of education.

5982 Philosophical Analysis and Education (3) Philosophical analysis of language and concepts in educational research and writing. Prereq: At least 2 courses in history or philosophy of education.

5990 Special Topics (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/N only. E

6000 Advanced Study in Lieu of Thesis (3) Critical analysis of research as it applies to classroom practice. Prereq: 5710 or 5800; 12 hrs at graduate level; or consent of instructor. W

6001 Research and Theory in Teaching Reading (3) Research and theory in application to teaching of reading; research design as it applies to reading investigations. Prereq: Two 5000-level courses in reading. W

6031 Seminar in Reading and Language Arts (3) Topics new to reading and language arts chosen by need and instructor(s). Prereq: 5000-level course in reading education and in language arts or consent of instructor. Su.

6032 Organization and Administration of Reading Programs (3) Synthesizing instructional and learning components of reading into classroom, school, and system programs. Prereq: 3 5000-level courses (preferably 5579 and 5304) in reading education or consent of instructor.

6040 Seminar in Curriculum and Instruction (1) Required three quarters. S/N only. E

6050 Advanced Studies in Elementary Education (3) Critical analysis of research as it applies to classroom practice. Prereq: 5710 or 5800; 12 hrs at graduate level; or consent of instructor. W.

6080 Advanced Seminar in Philosophy of Education (3) Some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.

6081 Phenomenology and Education (3) Theory and applications to selective educational issues. Prereq: 2 courses in history or philosophy of education.

6082 Philosophical Analysis and Education (3) Philosophical analysis of language and concepts in educational research and writing. Prereq: At least 2 courses in history or philosophy of education.

6090 Special Topics (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/N only. E

6091 Independent Study (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/N only. E

6092 Supervised Readings (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/N only. E

6150 Education as Social Policy (3) Education as instrument of national policy; topical problems faced by society in shaping educational programs. Prereq: Consent of instructor.

6210 Seminar in Elementary School Social Studies Research (3) Current research in elementary social studies, status of research in field, needed research-related research from other fields. Prereq: Undergraduate course and one graduate course in social studies, or equivalent. Su.

6230 Programs for Curriculum Improvement (3) W

6240 Interpretation of Research in Curriculum and Instruction (3) Research studies and relation of findings to professional assignments. Prereq: 5800 or 5710 or equivalent.

6250 Seminar in History of Education (3) May be repeated with consent of instructor. W

6282 Advanced Studies in Elementary School Science (3) Critical analysis of current research in elementary school science. Prereq: Undergraduate course and one graduate course in science, or equivalent.
6350 The Professional Education of Teachers (3) Principles and practices of preservice preparation of teachers for American elementary and secondary schools; current and historical trends and issues; innovations and directions for future.

6400 The Dynamics of Educational Change (3) Interdisciplinary approach to change process in education. Prereq: Consent of instructor.

6500 Advanced Studies in Early Childhood Education (3) Prereq: 2 graduate level courses in early childhood education and consent of instructor. May be repeated. Maximum 6 hrs. S/NC only.

6510 Advanced Studies in Elementary School Language Arts (3) Critical research analysis of selected issues in elementary school language arts. Prereq: 2 graduate level courses in elementary school language arts or consent of instructor. Sp

6511 Advanced Studies in Educational Anthropology (3) Ethnographic methods applied to formal and nonformal educational settings. Prereq: 2 courses in cultural anthropology, educational anthropology, or consent of instructor.

*6910-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2) Preparation and evaluation of dissertation proposals. Prereq: Completion of at least one research competency or consent of instructor. S/NC only.

6710 Advanced Educational Statistics (3)

6720 Interpretation of Data (3) Types of data in published materials in education; principles of sound interpretation.


6731 Advanced Studies in Curriculum (3) Analysis of influential curriculum theories and approaches, structure and design of educational programs. Prereq: 5580 and 5350 or equivalent.

6830 Studies in Mathematics Education (3) Reading and study related to historical trends and issues in mathematics education in United States providing broad perspective on current curriculum problems and future trends. Prereq: 5830 or consent of instructor.

6850 Principles of Educational Leadership (3) Conflicting concepts, with application to major problems in instruction, supervision, and administration.

6899 Internship (1-8) Advanced level experiences in application of principles and practices of curriculum development and instructional improvement. Program prerequisites must be met and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.

6960 Advanced Studies in Secondary Science and Environmental Education (3) Programs, materials, and recent research for middle and senior high schools, community colleges. Prereq: 5960 or equivalent, consent of instructor.

*May not be used toward meeting 6000 requirements.

Education

MAJOR

Ph.D.

DEGREE

Education

6001 Trans-College Seminar (1) Minimum of four consecutive quarters required of all Ph.D. students. Prereq: Admission to Ph.D. program. May be repeated. May not be used to meet 6000 requirement. S/NC only.

Educational Administration and Supervision

MAJOR

DEGREES

Education Administration and Supervision

Professors:

H. D. Stoliar (Head), Ph.D. Ohio State;

Associate Professors:


Assistant Professor:

N. T. Merz (Adjunct), Ed.D. Columbia.

Lecturer:


Programs are planned for (1) students preparing for administrative positions normally found in the educational structure of the state; (2) students preparing for the position of supervisor of educational administration; (3) administrators and supervisors in service who wish to improve their professional competence; (4) students and teachers preparing for teaching positions involving administrative responsibilities; and (5) students preparing for teaching educational administration or for administrative positions in higher education.

In addition to M.S. and Ed.D. degrees, a special two-year graduate program is offered which leads to the Ed.S. (Specialist in Education) degree and which provides advanced preparation for applicants judged to be potentially competent school administrators.

5310 School Administration and Civil Rights Issues (3) To help school administrators meet responsibilities and resolve problems stemming from civil rights legislation pertaining to race, sex, and the handicapped.

5420 District Level Administration (3) Role of central administrative team and relationships, behaviors, and competencies to develop an effective school organization.

5430 Building Level Administration (3) For beginning school principals and administrators, and for those operating in rural elementary, secondary, or consolidated schools. W, Su

5440 Introduction to Law, Finance, and Business Management at the Building Level (3) Orientation for beginning principals for basic foundations of the American legal system; how case law effects daily building level operations; building level methods of fiscal and logistical support measures. W, F, Su.

5450 Organization of the School Program (3) For principals and supervisors; conceptual and technical skills in organizing school program including curriculum, instruction, student grouping, staff, schedules, and space, F, Sp, Su.

5460 Personnel Administration: Local School (3) Planning personnel needs; job analysis; recruitment; selection; placement; orientation of new staff; employment and dismissal; and contract administration for both professional and supporting staff. W, Su.

5470 Introduction to School Facility Planning (3) For school administrators; facility planning; skills in building planning, maintenance, and evaluation. F, Su.

5480 Instructional Supervision—Local School (3) Developing a concept of supervision; instructional help, support, and service for teachers; supervision of curriculum; staff development; and staff evaluation. F, Sp, Su.

5530 Introduction to Educational Planning (3) Processes for improving decision-making functions through both quantitative and qualitative planning techniques. Relating educational policy analysis to educational planning. F, Su.


5560 Research for Educational Administrators (3) Descriptive, experimental, and quasiexperimental designs to help student without quantitative background to read and understand technical literature. Primarily for nonthesis option students. Should be taken early in M.S. or Ed.S. program. W, Su.

5580 Seminar in Communication Skills for Educational Administrators (3) Identification, development, and use of interpersonal and group related communication skills. Sp

5711 Problems in Educational Administration and Supervision: School Operation (3) May be repeated. E

5712 Problems in Educational Administration and Supervision: Higher Education (3) May be repeated. E

5713 Problems in Educational Administration and Supervision: State School Administration (3) May be repeated. E

5714 Problems in Educational Administration and Supervision: Community Education (3) Independent study of administrative problems. May be repeated. E

5751 Problems in Educational Administration and Supervision: Community Education (3) Independent study of administrative problems. May be repeated. E

5762 Problems in Educational Administration and Supervision: Finance (3) May be repeated. E

5753 Problems in Educational Administration and Supervision: Transportation (3) May be repeated. E
teaching. The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49. Appropriate courses taken in this department and in the Department of Psychology will satisfy requirements for certification as a school psychologist. Write the department for information concerning the program requirements. Application deadlines to Ed.D./Ph.D. are February 1 and May 1; Ed.S. and M.S. deadlines are October 15, February 1, May 1, and July 15.

4110 Psychology of Sex Role Development (3) Examination, from both a theoretical and research base, of factors which contribute to sex role development and definition in society and role of education in these changes. For student with minimal background in behavioral sciences. F, Sp, Su

4130 Mental Health (3) Studies and exploration of positive mental health. Application of mental health concerns to a study of a battery of personality assessment instruments.

4350-60-70 Special Topics and Problems (1-6, 1-6, 1-6) May be repeated. S/NC or letter grade.

4440 General Evaluation Procedures for Public Schools (3) Prereq: 2430 or equivalent. E

4560 Standardized Testing (3) Use and interpretation of standardized group instruments in assessment of intelligence, aptitude, achievement, vocational interests, and personality adjustment. E

4590 The Construction of Classroom Tests (3) Concerned with teacher-made classroom tests: instructional objectives, principles of test construction, item analysis, evaluation a test validity and item validity, interpretation of test scores, relationship between testing and grading. W, Su

4780 Advanced Child Study (3) Prereq: 2430 or 3810 or consent of instructor. W, Su

4800 Psychology of the Disadvantaged Child (3) Significant behavioral differences and causes; appropriate intervention approaches. F

4810 Psychoeducational Aspects of Appalachian People (3) Exploration of psychology of people of Appalachia to a study of the group examined as a function of history, culture, and role of education. W, Su


4890 Differential Psychology (3) Nature and sources of individual differences in behavioral characteristics, and differences between racial, ethnic, socioeconomic, sex, and other groups.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time for a degree is completed. May be used toward degree requirements. May be repeated. S/NC only. E

5040 Guidance and Pupil Personnel Services in Education (3) (Same as Vocational-Technical Education 5040). F, Su

5050 Children and Adolescents (3) Mental, social, physical, and emotional growth, development, and learning of children and adolescents: prevention, identification, and remediation of learning problems. W, Su

5060 Group Approaches with Students (3) Knowledge and skills appropriate to functioning with groups in counseling: psychological and parent education. F, W, Su

5070 Seminar in Elementary School Guidance (3) Trends, role, function, and administration of guidance in elementary school. Sp

5099 Field Work (1-6) Practical experience in de-
6610-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2) Preparation and evaluation of dis- 
sertation proposals. Prereq: Two consecutive statis-
tics courses or consent of instructor. E, F, W, Sp

6750-60-70 Special Topics and Problems (1-6, 1-
6, 1-6) Not to be taken to fulfill regular 6000-level 
courses or dissertation. Prereq: Two consecutive statis-
tics courses or consent of instructor. May be repeated. Maximum 12 hrs. May be taken for 
letter grade or S/NC. E

6810 Seminar in Counseling (3) Selected counsel-
ing theory, topics, issues, Prereq: 5890 or consent of 
instructor. May be repeated. Maximum 6 hrs. E, F, W, Sp

6840-50-60 Seminar in Professional Issues (1, 1-
Job selection, convention participation, pub-
lishing, writing grant proposals, consulting, etc. For 
final year doctoral students only. S/NC only. F, W, Sp

6910 Special Topics Seminar (3) Exploration of 
specific research or theoretical topics with students 
who have necessary background. Topic will vary 
from quarter to quarter, depending upon instructor. 
Prereq: Advanced standing as doctoral student. May be repeated. S/NC only. W, Sp

6931-32-33 Practicum in Counseling Psychology 
(3, 3, 3) Supervised practice. Minimum: 90 clock 
hours each quarter. Prereq: Admission to counseling psychology program and consent of instructor. 
6940 Group Counseling Practicum (3) Supervised prac-
ticums with children and/or adults. Prereq: Pre req: 5340, 
5890, 5907, and 5940 and consent of instructor. May be repeated with consent of department. Minimum 6 
hrs.

6941-42-43 Practicum in Guidance, Counseling, 
and Personnel Services (3, 3, 3) Supervised prac-
ticums in guidance and personnel services. 
Minimum: 90 clock hours each quarter. Prereq: 5890 
and consent of instructor. E

6944-45-46 Teaching Practicum (3, 3, 3) Prereq: 
Acceptance in doctoral program and consent of in-
structor. May be repeated. Maximum 6 hrs for each 
course. E

6950 Counseling Supervision (3) May be repeated 
with consent of advisor. Prereq: 5890, 5940, 6810, 
6941. S/NC only. E

Special Education and Rehabilitation

MAJORS

Special Education

Vocational Rehabilitation Counseling

DEGREES

M.S.

Professors:

R. M. Frey (Head), Ed.D. Illinois; L. J. Coleman, 
Ph.D. Kent State; E. D. Doll, Ph.D. Pennsylvania; 
C. H. Avans, Ed.D. Texas; R. M. Holbert, 
Ph.D. Texas; J. M. Nadolsky, Ed.D. Auburn; 
Mississippi State

Associate Professors:

J. L. Cassell, Ph.D. Kansas; C. R. Colvin, Ed. D. 
Virginia; F. S. Essary (Emeritus); Ph.D. Michigan; 
T. George, Ed.D. Illinois; M. C. Hannum, Ed.D. 
Northern Colorado; C. J. Maiel, M.Ed. Texas; 
W. J. Schindler, Ph.D. Kent State.

Assistant Professors:

S. M. Benson, Ed.D. Columbia; K. H. Kopp, Ph.D. 
Communication; W. M. Holbert, Ph.D. Nashville; 
Auburn, W. E. Woodrick, Ed.D. Mississippi State

Instructors:

W. D. C. Griffin, M.S. Tennessee; G. D. Tyler, M.S. 
Tennessee; K. M. Wardan, M.S. Tennessee.

Lecturers:

R. J. Brooks, M.S. Tennessee; Z. H. Brody, M.A. 
Tennessee; H. L. Byrd, Jr., M.S. Tennessee; 
O. E. Reese, B.S. Memphis State

The Department of Special Education and Rehabilitation provides competency-based programs and practica to prepare regular, 
special education, and rehabilitation personnel to work with exceptional persons: 
children and adults. Specialized courses may be 
distributed over the several areas of 
exceptionality with emphasis in an area of 
特殊 interests or need. Facilities are 
available for continuous observation and 
participation in direct relationships with 
handicapped children and adults who are 
hospitalized, homebound, or in residential 
schools, special classes, or regular classes.

Courses specifically planned in 
specialized areas to include (1) hearing 
impaired; (2) gifted; (3) learning disabilities; 
(4) mentally retarded; (5) multiple disabilities; 
(6) socially or emotionally maladjusted; (7) 
rehabilitation counseling for welfare; (8) 
disability evaluation education; (9) general 
special education and rehabilitation.

Problems lead to the Master of Science degree in Special Education. Prereq with emphasis in one of the specialized areas.

Under the sponsorship of Social and Rehabilitation Services, a specialized institute for the preparation of professionals to adapt 
their skills toward services to hearing impaired and deaf people is provided.

Further information write the department head.

EDUCATION OF THE 
HEARING IMPAIRED

4000 Rehabilitation Practicum (3) Evaluation of 
candidate data processing rehabilitation prognosis. 
Prereq: 4230. F, Sp

4190 Speech Development of Hearing Impaired 
(3) Anatomy and physiology of speech system. 
Relation of hearing to speech development. Theories 
and techniques of speech development and 
rehabilitation for hearing impaired children. Prereq: 
Audiology and Speech Pathology 4250. E

4200 Practicum in Speech Development of Hear-
ing Impaired (3) Applications of theories and techni-
cues of speech development and improvement with 
hearing impaired children. Prereq: Consent of instructor. 
Prereq: (Same as Audiology and Speech Pathology 
4250.) W, Sp

4210 Language Development of Hearing Impaired 
(3) Systems by which formal language is presented. 
Prereq: Audiology and Speech Pathology 4210. F, Sp

4220 Language Development of Hearing Impaired 
(3) Techniques; various systems by which formal 
language is presented. Prereq: 4210 or consent of instructor. 
Prereq: Audiology and Speech Pathology 4220. W, Su

4230 Communication Processes for the Hearing 
Impaired (3) Various communicative skills required 
by hearing impaired person: speech and language 
development; auditory training, speech reading, 
manual language and its relation to other forms of 
communication. Observations and practicum. 
(Stud- en 
ent must acquire a degree of proficiency in use of 
manual languages.) Prereq: Consent of instructor. E

4231 Communication Processes for Hearing Impai-
ed II (3) Intermediate course in manual com-
munications skills and techniques with emphasis on 
vocabulary development with receptive and expres-
sive fluency. Prereq: 4230 or consent of instructor. A

4240 Nature of Hearing Impairments (3) Basic 
principles of audiogenic, anatomy and physiology of 
hearing; nature and causes of hearing loss; methods 
and instrumentation for assessment of hearing level; 
and aural rehabilitation disciplines. Observations and practicum. F, Sp

4250 Introduction to the Psychology and Educa-
tion of the Hearing Impaired (3) For those planning 
to enter field of teaching deaf and hard-of-hearing. 
Review of history of education of deaf. Research study 
in psychology, social adjustment, and learning of deaf. Survey of professional literature in 
area of deaf child and adult. (Same as Audiology and 
Speech Pathology 4250.) E

4280 Curriculum Development in Elementary and 
Secondary Schools for Hearing Impaired (3) 
Adaptation of curriculum development and methods 
in public school education to meet needs of deaf and 
hard-of-hearing students in residential and inte-
grated settings. W, Su

4290 The Teaching of Reading to Hearing Impaired 
Children (3) Readiness activities, development-
ment approaches, theories, and specialized mate-
rals for curricula in teaching reading; W, Su

4570 Student Teaching with Hearing Impaired 
Children (9) Supervised practicum with preschool, 
day school, and residential pupils. S/NC only. F, W, Sp

4571 Practicum with Hearing Impaired Children 
(6) S/NC only. F, W, Sp

5250 Linguistics in the Education of the Hearing 
Impaired (3) Recent research and developments in 
linguistics related to hearing impaired. F, Su

5260 Seminar in Language Remediation for the 
Hearing Impaired (3) Current and recent develop-
ment in educational methodologies and to research 
pertaining to teaching language to hearing impaired. 
Research and materials current in use of various sign 
language systems and methods. Emphasis on 
approaches which accommodate and assist integrati-
on of hearing impaired children in regular class-
rooms. W, Su

5280 Seminar on Educational Implications of 
Language Deficiency (3) Readings, discussion, 
and projects on impact of language deficiency on 
educational programming for children with language 
deficiency. Sp, Su

5310-20-30 Manual Communication (2, 2, 2) Basic 
and advanced skills in fingerspelled and signed 
forms of communication. Emphasis on ability to 
express and receive the manual forms. Prereq: Con-
sent of instructor. Must be taken in sequence. F, Su; 
W, Su; F

5460 Educational and Vocational Guidance of the 
Deaf and the Hard of Hearing (3) Evaluation; test 
techniques for diagnosis and guidance; social and 
personal adjustment; occupational opportunities. 
F, Sp

5540 Seminar in Language Pathology (3) (Same as 
Audiology and Speech Pathology 5540.)

5820 Curriculum Development Applied to Pro-
grams for the Hearing Impaired (3) Current curric-
ulum trends adapted for hearing impaired indi-
viduals. New curriculum options in education of 
these children. Current education theories for pro-
grams for hearing-impaired children. Prereq: Curric-
um and instruction 5890 or equivalent and consent of instructor. Sp

EDUCATION OF THE 
MENTALLY RETARDED

4110 The Nature and Concept of Mental Retarda-
tion (3) Identification, description, and study. E

4120 Education of the Mentally Retarded Child (3) 
Philosophy and rationale underlying teaching and 
guidance of mentally retarded; methods and mate-
rials in special and regular classes. Prereq or coreq: 
4110. E

4440 High School Program for the Mentally Re-
tarded (3) Trends, issues and research relating to 
care and work study programs. E

4810 Student Teaching Mental Retardation (3) 
Prereq: Major in education of mental retardation. S/ 
NC only. F, W, Sp

4811 Student Teaching Mental Retardation (9) 
Prereq: Major in education of mental retardation. S/ 
NC only. F, W, Sp

4922 Student Teaching of the Educable Mentally 
Retarded (3) Observation and supervised practi-
cum. S/NC only. E

5111 Psychology of Mental Retardation (3) Inte-
5112 Psychology of the Severely Mentally Retarded (3) Program and curriculum development for training in the education of severely retarded in public schools, institutions and privately operated schools and workshops. Su

5113 Advanced Curriculum for the Mentally Retarded (3) Active learning, development models, methods and procedures, curriculum in education of mentally retarded children and adults. Emphasis on varied curriculum alternatives and extended education. Sp, Su

MULTIPLE DISABILITIES

4130 Education of the Brain-Injured Child (3) Nature of brain-injured child; skills for identifying educational, physical, and emotional characteristics; special educational techniques. E

4150 Education of Children with Crippling and Special Health Conditions (3) Medical and educational characteristics; appropriate educational modifications and associated services. Prereq or coreq: 3333 or consent of instructor. S

4840 Educational Problems of the Cerebral Palsied Child at Home and School (3) Physical, social, and educational needs of cerebral palsied; evaluation techniques; related services. A

4921 Student Teaching in Crippling and Special Health Conditions (3) Observation and supervised practice in home, hospital, and classroom. S/NC only. E

EDUCATION OF THE EMOTIONALLY DISTURBED

4510 Nature and Characteristics of Learning and Behavior Problems (3) Forms of academic, social, and behaviorally disturbing behaviors, degree of severity, possible causes, and relationships to each other. Prerequisites: Consent of instructor. Focus on personality characteristics and development factors interpreted through behavioral and psychodynamic theory as well as practical situations in which learning and behavior disorders may occur. E

4620 Education of the Emotionally Disturbed Child (3) Managing behaviors, models for instruction, teaching techniques and materials, and teacher-pupil family interpersonal relationships as basic to academic achievement for the pupil. Prereq: 4510 or Su

4659 Practicum in Residential Settings Serving Children with Disturbing Behavior (3) Practice in scientifically identifying, observing, and recording disturbing behaviors. Initiating behavior changes related to personality characteristics and development factors. To perform in a tutorial capacity within a residential classroom; and to take part in discussion and report writing on relevant academic curriculum and reinforcement schedule. Prereq: 4610 and 4620 or consent of instructor. A

4640 Practicum in Public School Systems Serving Children with Learning and Behavior Problems (6) Academic tutoring in a teacher aide capacity within regular classrooms. Particular emphasis and practice in individualizing instruction for learning and behavior problem children within the regular classroom setting. Discussion and evaluation of relevant methods and materials unique to each teaching situation. Prereq: 4610 and 4620 or consent of instructor. A

4924 Student Teaching of the Emotionally Disturbed Child (3) Active learning, observing verbal and nonverbal behavior, empathetic understanding, and communicating with handicapped individuals. F

5140 Approaches to Rehabilitation Counseling (3) Approaches and techniques in individual and group counseling with the mentally retarded and adults to further develop student's counseling skills. Problem-solving techniques and utilization of alternative modes of counseling procedures in rehabilitation. Prereq: 5170 or consent of instructor. W

DISABILITY EVALUATION EDUCATION

5700 Evaluation and Mobilization of Community Resources (3) Issues, processes, and programs related to community resources and service integration with emphasis on social and rehabilitation facilities and agencies. Assessment utilization and mobilization of community resources to further develop of innovative service programs for handicapped. W

5710 Medical Aspects of Disability I (3) Endocrine, mental, visual and hearing disorders. Related to musculoskeletal, neurological, circulatory, and respiratory diseases/disorders. Effect on structure and function of human body. Restorative measures to eliminate or minimize resulting handicaps; skills necessary to communicate effectively with lay persons and medical community on evaluation of impairment and administration of appropriate rehabilitation services. W

5720 Medical Aspects of Disability II (3) Endocrine, medical signs, symptoms and diagnostic procedures related to neoplastic, skin, digestive, genito-urinary, and mental health disorders. Effect on structure and function of the human body. Restorative measures to eliminate or minimize resulting handicaps; skills necessary to communicate effectively with lay persons and medical community on evaluation of impairments and administration of appropriate rehabilitation services. Sp

5730 Vocational Assessment in Disability Evaluation (3) Vocational assessment: resource materials; criteria for vocational assessment of disability insurance claims under Social Security; on-site job analysis and case file vocational assessment experiences. Prereq: Admission to program in disability evaluation or consent of instructor. Sp

5740 Disability and Work in Society (3) Relationship of work to physical, social, psychological, and economic development of disabled individual. Process and techniques of vocational evaluation; work adjustment services in rehabilitation. F

5750 Principles and Problems of Disability Evaluation (3) Individual identification and analysis of principles and problems of disability evaluation process or structures; emphasis on problems of disability evaluation process or structures, and innovation, exploration of alternatives, and sharing experience within group. Prereq: 5760 or consent of instructor. W

5760 Seminar: Functional Capacity Assessment (3) Criteria for residual functional capacity assessment; problems in achievement or acquisition of residual functional capacity assessments. Prereq: 5710-20 or consent of instructor. Su

5770-71 Current Problems in Disability Claims Evaluation (1-3, 1-3) Current problems in process, content, or administration of disability claims evaluation; workshops in identification and proposal of alternative solutions. May be repeated with consent of instructor. S/NC only. A

SCHOOL SPEECH AND HEARING THERAPY

4030 The Public School Speech and Hearing Program (3) Organization, administration, and procedure. Sp

4040 Appraisal of Speech and Language Disorders (4) (Same as Audiology and Speech Pathology 4040.)

4310 Stuttering (3) (Same as Audiology and Speech Pathology 4310.)

4320 Introduction to Clinical Practice in Speech Pathology (3) (Same as Audiology and Speech Pathology 4320.)

4330 Clinical Practice in Speech Pathology I (1-6) (Same as Audiology and Speech Pathology 4330.)

4340 Clinical Practice in Speech Pathology II (1-6) (Same as Audiology and Speech Pathology 4340.)

4341 Clinical Practice in Communication Disorders in Schools (3) Prereq: 4303, 4320-30-40 and consent of instructor. S/NC only. F, W, Sp

4342 Seminar in Communication Disorders in Schools (3) Prereq: 4303, 4320-30-40 and consent of instructor, F, W, Sp

4400 Voice Disorders (4) (Same as Audiology and Speech Pathology 4400.)

4720 Audiology II (4) (Same as Audiology and Speech Pathology 4720.)
5510-20-30 Administrative Practicum on Problems In Institutional Care of Children (3, 3, 3) Physical and social development; business and personnel management. Prereq: Training and experience in institutions for children, or consent of instructor. A

5550-50-70 Problems in the Education of Exceptional Children (3, 3, 3) E

5555-65-75 Special Topics (1-3, 1-3, 1-3) S/NC or letter grade.

5620 Counseling Parents of Exceptional Children (3) Interpreting exceptionalities (handicapped and gifted) to parents and helping in understanding and acceptance of the child in school/home. E


5790 Career Development: Workshop (1-6) (Same as Educational Psychology 5790.) A

5830 Seminar: Issues and Theories in the Education of the Exceptional Child (3) Current trends in education of exceptional child, application of philosophical approaches to education, analysis of current theories of integration as applied to exceptional children. Current research concerning education and rehabilitation of exceptional persons. Prereq: Curriculum and Instruction 5600 or Educational Psychology 5210 and consent of instructor. A

5910-20-30 Problems in Lieu of Thesis (3, 3, 3) E

5970 Juvenile Delinquency and the School (3) Responsibility of school in study of social sources of maladjustment; school function in community program for children's welfare; curricular adjustments; directed study of socially maladjusted children; environment, and programs for meeting needs.

Vocational-Technical Education

MAJORS

Agricultural Education M.S. M.S., M.ACT

Business Education M.S.

Industrial Education M.S.

Vocational-Technical Education M.S., Ed., Ed.D.

Education Ph.D.


THE MASTER'S PROGRAM

The M.S. degree with a major in vocational-technical education is available with concentrations in agricultural education, business education, distributive education, general vocational-technical education, home economics education, industrial education, and technical education. Requirements are:

- Concentration 18 hrs
- Research 6 hrs
- Electives 12 hrs
- Thesis Option 9 hrs
- Problems in Lieu of Thesis Option 9 hrs
- Course Option 15 hrs

All course work must be approved by the student's committee.

Each vocational service area (agricultural education, business education, distributive education, industrial education and vocational-technical education) offers similar programs leading to the Master's degree. Both thesis and non-thesis options are available. Details regarding the Master's programs of each of the service areas may be obtained from the coordinating professor. The M.A.C.T. is also available in the business education area.

THE SPECIALIST PROGRAM

The Ed.D. degree program, which is a thesis or non-thesis program, is a cooperative undertaking involving all vocational service areas. Options are available in agricultural, business, distributive, home economics, and industrial education and in general vocational-technical education.

THE DOCTORAL PROGRAM

The comprehensive Ed.D. program in Vocational-Technical Education is designed to provide for achieving professional objectives, developing needed competencies, and gaining desirable experiences and understanding of vocational-technical areas.

The Vocational-Technical Education doctoral curriculum consists of the following: professional education core, 9 hours; service area, 18 hours; vocational-technical education, 18-27 hours; cognate fields, 9-18 hours; research techniques, 15 hours (consult advisor for details); and dissertation, 36 hours. A minimum of 120 hours above the baccalaureate is required.

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

General

4010 Development and Utilization of Advisory Committees (3) Craft advisory committees, selection, organization, implementation, and utilization.

4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750 and Library and Information Science 4750.)

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15)

5403 Resource Teachers for the Handicapped (3)

To help students acquire the skill to maintain mildly handicapped children in regular public education environments; job descriptions and expectations, observation of communication disorders; information on referral procedures, agencies, legislation; incorporation of speech improvement-language development activities into regular curriculum. For students not majoring in speech pathology or audiology.

4740 Evaluating Exceptional Students (3) Mandates relative to evaluations; theoretical considerations and methods of evaluating exceptional students; basic statistical concepts relative to normalcy and reference tested. Prereq: 5333 or consent of instructor. E

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15)

5403 Resource Teachers for the Handicapped (3) To help students acquire the skill to maintain mildly handicapped children in regular public education environments; job descriptions and expectations, observation of communication disorders; information on referral procedures, agencies, legislation; incorporation of speech improvement-language development activities into regular curriculum. For students not majoring in speech pathology or audiology.

4740 Evaluating Exceptional Students (3) Mandates relative to evaluations; theoretical considerations and methods of evaluating exceptional students; basic statistical concepts relative to normalcy and reference tested. Prereq: 5333 or consent of instructor. E

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15)
5005 Problems in Lieu of Thesis (3) May be repeated.
5010 History and Organization of Vocational-
Technical Education (3) Vocational and technical education in public schools through analysis of social, cultural, legislative, and organization models.
5020 Placement, Follow-up and Evaluation Pro-
cedures in Occupational Education (3) Methods and procedures in establishing placement programs, curriculum revision.
5030 Organization and Operation of Area Voc-
ational-Technical Schools (3) Area vocationaltechnical school concept, administration and supervision of vocational and technical education programs in area schools.
5040 Guidance and Pupil Personnel Services in Edu-
cation (3) (Same as Educational Psychology 5040.)
5050 Supervision of Vocational-Technical Educa-
tion (3) Program planning, coordination, instruction. Roles and functions of supervisors.
5055 Vocational School Administration and Man-
agement (3)
5070 Competency Based Vocational Education (3) Introductory, comparative, and practical approaches.
5080 Continuing Education in Vocational-
Technical Education (3) Importance, objectives, historical development, psychological and sociological formulations, methods and techniques, research, evaluation.
5100 Occupational Program Development for Disadvantaged Persons (3) Academic, socioeconomic, cultural and/or other handicaps that prevent individuals from succeeding in regular vocational education programs.
5110 Principles and Objectives of Vocational-
Technical Education (3) Fundamental principles and contemporary objectives.
5130-31-32 Problems in Vocational-Technical Educa-
tion (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.
5140 Individual Study in Vocational-Technical Educa-
tion (1-3) Must be approved by supervisor instructor and service area coordinator or department head. Approval form must be filed in office of department head. May be repeated. Maximum 12 hrs.
5150 Microcomputer Operations and Educational Applications (3) Operating systems, techniques. Hands-on experience in operating common microcomputers, writing, debugging, and running education programs.
5155 Software Design for Microcomputers in Edu-
cation (3) Advanced BASIC software design: operating System-CPI, TRS80DOS and OSI, sequential and random I/O, analysis and operation of commercial educational programs, and teacher-designed programs.
5180-00 Educational Specialist Research and Thesis (3, 3, 3) Selection, analysis, and completion of problem necessitating original investigation, beneficial to investigator and vocational-technical field.
6000 Doctoral Research and Dissertation (3-15)
6010 Curriculum Planning in Vocational-
Technical Education (3) Prereq: Curriculum and In-
troduction 5410 or equivalent.
6020 Program Planning and Development in Vocational-Technical Education (3) Planning vocational-technical and work force state, local, and institutional programs; research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.
6030 Evaluation of Vocational-Technical Educa-
tion Programs (3)
6040 Seminar in Vocational-Technical Education (1, 1, 1) Required 3 consecutive quarters during resid-
ency. S/NC only.
6050 Administration of Vocational-Technical Educa-
tion (3) Administrative principles and relation-
ship to vocational and technical training.
6111-12-13 Internship in Vocational and Techni-
cal Education (3, 3, 3) Field experiences in selected areas of vocational and technical education. S/NC only.
Agricultural Education
4230-31-32 Problems in Agribusiness Education (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.
4240-41-42 Seminar In Agricultural Education (1, 1, 1) Prereq: 4350 or consent of department head.
5210 Supervision of Student Teaching in Agri-
cultural Education (3)
5220 Teaching Agricultural Mechanization in Vocational Agriculture (3) Prereq: 4350.
5230-31-32 Special Problems in Agricultural Educa-
tion (3, 3, 3) May be repeated. Maximum 18 hrs.
5240 Current Literature in Agricultural Education (1-3) May be repeated. Maximum 6 hrs.
5250-51 Agricultural Education in Off-Farm Agri-
ultural Occupations (3, 3) Developing occupational experi-
ence programs; course planning, teaching procedures. Prereq: 4350.
5260 Agricultural Education for First-Year Teachers (3) Adjustment to situation in which em-
ployed; group meetings in selected centers, and visits by instructor. Prereq: 4350.
5270 Adult Education in Agriculture (3)
5290 Supervised Occupational Experience in Agricul-
tural Education (3) Prereq: 4350.
Business Education
5305 Methods and Materials for VOE Programs (3) Development of instructional aids, recent de-
velopments and research, individualized instruction, occupational clusters.
5306 Organization and Management of VOE Pro-
grams (3) Developing office occupations, guide-
lines in cooperatives, laboratory, and model office programs. Physical facilities, instructional aids, re-
lated instructional activities (clubs), enrollle, instruc-
tor and advisory committees.
5307 Measurement in Business Education (3) Eval-
Uative methods and tools for all courses in busi-
ness education and related areas of study in secon-
dary and postsecondary business education.
5308 Curriculum in Business Education (3) Cur-
ricular designs in career, secondary, post-
secondary, and adult education. Legislation technol-
ogy, social, economic, and research results that affect business education curricula. Trends.
5309 Evaluation of Research in Business Educa-
tion (3) Prereq: Curriculum and Instruction 5610 or equivalent.
5310 Graduate Seminar in Business Education (3) Review of techniques for research and prepara-
tion of proposal for thesis or problem/project.
5311-12 Special Topics in Business Education (1, 1)
5313-14-15 Practicum in Business Education (2, 2, 2)
5320 Improvement of Instruction in Basic Busi-
ness Courses (3) Issues, research findings, methods, and materials for improved instruction at both secondary and postsecondary levels.
5330 Improvement of Instruction in Typewriting and Clerical Education (3) Research, principles of learning, issues and materials.
5340 Improvement of Instruction in Shorthand/ 
Secretary Subjects (3) Principles of teaching, issues, research findings, and materials on secondary and postsecondary levels.
5350 Improvement of Instruction in Accounting and Data Processing Programs (3)
5360 Improvement of Instruction in Business Com-
munications, Office Automation, and Projecting (3) Basics of and strategies for teaching written communica-
tions, word processing and oral communications.
5380-85 Problems and Projects in Business Educa-
tion (3, 3) Required in the non-thesis option. S/NC only.
5390 Problems in Business Education (1-9) Vari-
able topics. May be repeated. Maximum 9 hrs.
6300-10-20 Current Issues in Business Education (3, 3, 3)
6330-40-50 Advanced Studies in Business Education (3, 3, 3)
6360 Higher Education for Business (3)
Distributive Education
4430-31-32 Problems in Distributive Education (1-6, 1-6, 1-6) Research, issues in teaching and coordinating distributive education programs. May be repeated. Maximum 18 hrs.
4440 Supervised Distributive Experience (2) Mini-
imum 200 hours experience for each 3 credit hours in approved distributive business; concurrent analytical project. May be repeated. Maximum 9 hrs.
4450 Areas of Distribution (3) Marketing, product or service technology, social skills, basic skills, and distribution as they affect distributive education curri-
culum in secondary and postsecondary programs.
4460 Organization and Operation of Distributive Educa-
tion Programs (3) Background and develop-
ment needs, federal and state legislation; curriculum implications; establishing, evaluating, reporting, and improving programs.
4470 Methods and Materials in Distributive Education (3) Prereq: 4310 or consent of instructor.
4480 Coordination Techniques in Distributive Educa-
tion (3) Selecting and placing supervising and training supervisors; advisory committees; adult and other community services. Prereq: 4310, 4320.
5410 Administration and Supervision of Distribut-
e Education (3) Preparation of distributive educa-
tion program and work of city or county supervisor. Understanding and appreciating problems from high school principals and department heads' point of view. Trends in distributive education; community surveys, state plans, teacher-coordinator qualifications, changing curriculum.
5416-26-36 Problems in Distributive Education: 
Retailing (3, 3, 3)
5420 Organizing and Teaching Adult Distributive Educa-
tion (3) Planning, organizing, promoting, teaching, and evaluating continuing education prog-
rans in distributive education, utilizing trade asso-
ciations, employment agencies, business groups, and advisory committees in implementation.
5430-31-32 Special Problems in Distributive Educa-
tion (3, 3, 3) Individual research, confer-
cence, and/or workshops in teaching and supervis-
ing high school, postsecondary, and adult programs.
Home Economics Education
5510 Organization of the Homemaking Curricu-
ulum in Secondary Schools (3) Recent advances in home economics education. Development of teaching material in farm to total homemaking program in secondary school-day-school, adults, home experience, and Future Homemakers of America.
5515 Evaluation in Home Economics Education (3) Purpose of evaluation in development of home economics education.
economic programs; techniques used in evaluation. Techniques for determining progress of students; individual problems of evaluation.

5530-31-32 Problems in Home Economics Education (1-3, 1-3, 1-3) May be repeated. Maximum 3 hrs per course.

5540 Curriculum Development and Implementation in Family Relationships Instruction (3) Content for teaching family relationships. Selected materials and methods, appropriateness for reaching curriculum objectives in family relationships.

5545 Wage Earning Programs in Home Economics (3) Planning, establishing, and implementing wage earning programs in home economics.

5550 Advanced Methods of Teaching Homemaking Classes for Adults (3)

5555 Supervision of Home Economics in the Public Schools (3) For teachers with successful experience in vocational home economics preparing for supervisory positions in vocational education. Program planning, organization, and administration. Field contacts with urban and rural programs.

5570-75 Seminar in Home Economics Education (3, 3) Research literature and techniques. Prereq: Consent of instructor.

5580 Teaching Home Economics in College (3) Methods, organization, and evaluation.

5581 The Problem Method of Teaching Home Economics (3) Underlying philosophy, skills and techniques. Observation and discussion.

5582 Furthering Good Human Relationships in the Classroom (3) Relationships between problems in human relations and the basic needs of individuals, techniques of interpersonal relations and social values in developing more effective teacher education programs.

Industrial Education

3850 History and Philosophy of Industrial Education (3)

3840-41-42 Part-Time Programs in Cooperative Industrial Training (3, 3, 3) Principles of organization, methods, and materials.

3850 Shop Organization and Management (3)

3860-61 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)

3870 School Shop Safety (3)

4610 Special Topics in Drafting (3) Industrial practices and drafting; students selected for the individual student. Prereq: 6 hrs drafting.


4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to careers. Prereq: 3621, 2641, 2660, 3651, or consent of instructor.

4671 Materials and Processes (3) Organic and inorganic materials and processes used to produce finished products. Content, curriculum and techniques of laboratory operation. Prereq: Consent of instructor.

4682 Power and Energy (3) Development, control, transmission, and potential of power; sources; content, curriculum, and techniques of laboratory operation. Prereq: Consent of Instructor.

4820 Foremanship Training by the Conference Method (3)

4830-31 Job Analysis (3, 3) Principles, practice, instructional methods.

4850-51 Curriculum Building in Trade and Industrial Subjects (3, 3) Course materials in trade subjects, results of job analysis, checking sheets and individual job sheets in both trade and related subjects. Prereq: or coreq: 4120.

4860-81-82 Seminar in Industrial Education (3, 3, 3) Educational innovations, current events, problems, and other topics associated with the field of industrial education.

4860-91-95 New Developments in Industrial Education (3, 3, 3) Developments, pressing problems, and recent trends in field of industrial education as presented by a coordinating instructor in conjunction with knowledgeable resource personnel.

5610-11-12 Administration and Supervision of Industrial Education (3, 3, 3) Principles of vocational education; relationships with general education and trade and labor organizations; administering and supervising schools and classes under federal vocational education acts.

5530-31-32 Special Problems in Industrial Education (3, 3, 3)

5840 Methods of Research in Industrial Education (3)

5850 Improving Teachers in Service (3) Problems of coordination in part-time and apprentice training programs.

5860 Advisory Committees and Apprentice Training (3)

5880 Advanced Methods of Teaching Skills and Technical Information (3) Proper selection and effective application of contemporary methods and techniques in teaching of specialized skills and technical related information.


5895 New Developments in Industrial Technical Education (3) Prereq: B.S. in Industrial Education and teaching experience.

School of Health, Physical Education, and Recreation

Madge, M. Phillips, Director

Graduate programs are available to students preparing for (1) teaching and research positions in colleges, high schools and elementary schools; (2) administrative and supervisory work in athletics, health education, physical education, and recreation; (3) recreation specialist positions in various public, voluntary, private, and commercial agencies and institutions; and (4) public health positions in community health education, health planning and administration, and environmental health.

THE MASTER'S PROGRAM

Four programs leading to the Master of Science degree are available: Physical Education, Recreation, Safety Education and Service, and School Health Education. Forty-five quarter hours are required for the M.S. Approximately 25 quarter hours of work selected from courses numbered 5000 and above are included in the M.S. requirement. Course selection shall be made according to each student's professional interests in health, physical education, safety, or recreation with the approval of the major professor.

Non-thesis options are available in all M.S. degree programs. A 3-quarter-hour course in research techniques and/or statistics and/or a seminar in research will be required. Each non-thesis degree candidate will take a final comprehensive examination.

Programs leading to the Master of Public Health are also available in community health education, health planning/administration, and occupational/environmental health and safety. Fifty-four quarter hours are required for the M.P.H. degree. One full quarter of field practice is required. During field practice, no student shall hold a full-time job except by special permission of the division chairperson. Students may be placed in all parts of the country.

DOCTORAL PROGRAM

The Doctor of Education and the Doctor of Philosophy degrees are offered in Health Education and the Doctor of Education in Physical Education. See further description under Health Education and Physical Education.

The basic requirements for admission are:

a. A minimum of 40 (physical education) or 50 (health education) quarter hours.

b. Submission of satisfactory references relating to training, employment, and character.

c. Evidence of successful teaching or potential for success in the major area of study.

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

Graduate Assistantships. A variety of graduate assistantships are offered in health education, physical education, safety education, and recreation to qualified women and men who are graduates of accredited colleges or universities. These assistantships are open to students in the Master's and doctoral programs.

Assistantships are made available by local schools, agencies and the School of Health, Physical Education, and Recreation in return for part-time services rendered. The services may consist of teaching physical education classes, teaching health classes, teaching safety classes and recreation classes, leading recreational activities, supervising recreation field work students, and directing or helping to manage extracurricular programs. Students interested in these opportunities should file their applications before February 1. Letters should be addressed to: The School of Health, Physical Education, and Recreation, The University of Tennessee, Knoxville, Tennessee 37916.

Departments of Instruction

Division of Health and Safety

MAJORS

Health Education
Public Health
Safety Education and Service
School Health Education

DEGREES

M.A.
M.P.H.
M.S., Ed.S.
M.S.
College of Education

Professors:
- R. H. Kirk (Chairperson), H.S.D. Illinois

Associate Professors:
- C. B. Hamilton, Ph.D. Oklahoma; J. Gorski, Dr. Phil. Georgia; M. A. Mills, Ph.D. California

Assistant Professors:

Lecturer:
- M. Duffy, M.D. Pennsylvania.

The Health and Safety Division offers the following degree programs:
- Master of Public Health degree with a major in Public Health Education. Option in community health education is accredited by the American Public Health Association. Options with specialization in health planning/administration or occupational/environmental health and safety are also available.
- Master of Science degree with a major in School Health Education or Safety Education and Service (thesis and non-thesis options)
- Non-thesis option requires 45 quarter hours of course work.

Educational Specialist degree in Safety Education and Service.

Doctor of Education degree in Health Education.

Doctor of Philosophy degree in Health Education.

Public Health

3000 Foundations of Health Science (3) In-depth study of content areas relating to personal health and contemporary health problems, i.e., mood modifying products, consumer health, international health care. E

3120 First Aid and Emergency Care (4) Theory and practice of first aid and emergency care. Instruction in medical self-help. Course leads to Red Cross Certification as an Advanced First Aid and Emergency Care. (Applicant must be at least 21 years of age.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate. F, W, Sp

4220 Communications for Better Health (3) Selective study of communications in health enterprise. Consideration in logical progression of the problems of transmitting current and new information to practitioners; communications among members of the modern health teams, among health agencies, and use of mass media for transmitting health information. W, Sp

4110 Consumer Health and Safety Education (3) Survey of major consumer health and safety problems; selection, purchasing, and financing of safety and medical services. E

4111 Instructor's Advanced First Aid and Emergency Care (3) Designed to teach first aid. Satisfactory completion qualifies one for American National Red Cross Certification as an Advanced First Aid and Emergency Care Instructor. (Applicant must be at least 21 years of age.) Prereq: 3520 or valid Advanced First Aid and Emergency Care Certificate. F, W, Sp

4220 Drug Abuse Education (3) Drug abuse problem and suspected causes: pharmacology of drugs and their effect on society and methods of drug abuse education. F, Sp

4430 Women's Health (3) Study of factors influencing women's health and their role as consumers of the nation’s health service delivery systems. F, W, Sp

4700-10-20 Field Practice in Public Health (3, 3, 3) Field practice in public health under supervision of public health profession. S/NC only. E

4730 Workshop in Public Health Education (3-6) For teachers, nurses, case workers, sanitarians, and other voluntary and public health agency personnel; emphasizes the problem-solving approach through small group interaction, case method, and critical incident technique. May be repeated. S/NC only. E

5010-20-30 Workshop in Public Health (3-6; 3-6; 3-6) Designed to deal with specific public health problems, to give practical experience to the student. Prereq: Consent of instructor. S/NC only. E

5700-90-90 Field Practice and Seminar in Public Health (3-5, 3-5, 3-5) Internship or field experience under professional supervision in public health. S/NC only. E

5110 Environmental Health (3-5) Varied environmental factors within general framework of air, food, water, shelter, transportation as they affect humanity's survival: prevention of disease, performance and enjoyment. Lecture, demonstrations, laboratory, and field practice. Prereq: Permission of instructor. Su


5150 Industrial Toxicology (3) Chapters of industrial toxicology as they relate to the improvement of occupational safety and health. Prereq: Consent of instructor. Sp

5220 Health and Sickness (3) Formulation of models of positive health within life cycle and within community: types of sickness afflicting individuals and groups. Su

5410 Epidemiology (3) Incidence and prevalence of disease in man. W, Su

5420 Administration of Public Health (3) Administrative considerations of public health agencies including governmental aspects, legal bases, organizational principles, personnel factors, fiscal management, and public relations. S/NC only. E

5430 Vital and Medical Statistics (4) Application of basic statistical principles to living things. F, W, Sp

5440 Methods and Materials in Public Health Education (4) Theory and practice in use of communication techniques and materials in community health education. S

5540 Factors in Problem Solving for Community Health (5) Tests skills in communications and group process en route to problem identification, objective setting, problem solving and planning for health education. 4 hrs and 2 labs. W

5550 The Public Health Educator in Community Organization and Development (4) Overview of health organizations and agencies in the community prefaces exploration of conflicting theories and divergent styles of practice in community organization and development. Laboratory to delineate a community near campus and to practice. 2 hrs and 4 labs. F

5550 Functions and Roles of the Public Health Educator (3) Professional science is examined with special attention to roles and functions. Consideration of philosophy and motivation and differences between health education service and health education program for community health levels. 2 2-hr lecture-seminar sessions per week. F

5580 Physical Activity and Health (5) (Same as Physical Education 5580.)

5705-10-15 Advanced Professional Health Education: Health Planning I, II, III (3-5, 3-5, 3-5) Theory and practice in selected areas. F, W, Sp

5730 Dental Health Education (3-5)

5740 Family Health Unit (3-5)

5750 Health and Medical Care Legislation and Law (3-5) Su

5755 Health Facilities Administration (3-5) W

5760 Health Services Administration (3-5) F

5785 Occupational Health Unit (3-5) Sp

5790 Self-Care Unit (3-5) Sp

5785 The Training of Paramedical Personnel (3-5) F

5840-50-60 Problems in Public Health Education (1-3, 1-3, 1-3) Individual identification of current issues; extensive reading and critical analysis of literature. E

8000 Doctoral Research and Dissertation (3-15)

8030 Critical Analysis of Writing and Research in Health Education (3) (Same as School Health Education 8030.) F

8050-60 Seminar in Health Education (3, 3) (Same as School Health Education 8050-60.) W, Sp

8120 Health Aspects of Gerontology (3) Su

8220 Seminar on the Nation's Health (3) F

8230 International Health (3) W

Safety

3520 Community Health Problems—Alcoholism (3) Explores problems of alcoholism regarding overall health of community. E

4120 Community Health Problems—Alcoholism (3) Explores problems of alcoholism regarding overall health of community. Emphasis placed on factors making alcoholism a serious public health problem. Various types of educational programs to control the disease are covered. F

4130 Community Health Problems—Suicide (3) Explores problems of suicide regarding overall health of community. W

4140 Community Health Problems—Death Education (3) Exploration of ramifications of death and dying as related to personal and community health. E

4210 Urban and Industrial Health (3) Health problems created by a burgeoning population and the megalopolis; industrial health problems of concern to management, supervisor, and industrial worker; control of occupational diseases, poisons, accidents, and other conditions incidental to industry. Sp
3620 The Teaching of Sex Education (3) Trends, content, methods, and materials in sex education. F, W, Sp

3650 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. E

4710 Workshop In School Health Education (3-4) For advanced students, teachers, school administrators, nurses and other paramedical school personnel. Emphasis on implementation of relevant programs. F

4810-20-30 Problems in School Health Education (1, 1, 1) Individual identification and study of current problems in school health education. Extensive reading of literature. E

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5230 Behavioral Problems in Safety Education and Accident Prevention (3) Problems of behavior, causes of accidents, and application of principles of psychology and guidance to safety behavior in all segments of our environment. F

5330 Problems and Research in Accident Prevention (3) Analysis of safety problems found in wide variety of accidents that occur in community, findings of current research in behavioral sciences as related to variation incidence of accidents. Sp

5340 Organization, Administration, and Supervision of Safety Programs (3) National, state, and local safety problems, including administrative, instructional, and supervisory aspects. Basic emphasis on implementation of relevant programs. W

5350 Civil and Defense Education (3) Civil and defense problems: tornadoes, floods, fires, mass civil disorders, and nuclear and personnel attack by alien countries. Sp

5720-30-40 Graduate Workshop in Safety (3-5, 3-6, 3-6) Deals with specific safety problems. Special safety problems in a concentrated period of time. Su


5870-80-90 Current Issues in Safety Education (1, 1, 1) E

6010-30-30 Internship and Research in Safety (3, 3, 3) Allows the student opportunities for engaging in field experience so that a significant problem in that experience will be identified, researched, and reported on in acceptable form. E

School Health

3210 First Aid and Emergency Care (4) [Same as Public Health 3210] E

3410 School Health Instruction (3) Selection of health content in the school curriculum. E

3420 School Health Services (3) Development, maintenance, and protection of health of students including examination, screening, special services, communicable disease control, emergency care, and school health records. F, W, Sp

3510 The School in Community Health (3) Role of teacher in community health education; school's responsibility in promoting healthful living and the placing of health problems in larger social agencies in program. Not open to health and physical education majors. E

3610 Methods in Elementary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. Required for elementary teachers. Prereq: 3510 or Public Health 1110 or Nutrition 1230. E

Division of Physical Education

MAJOR

Physical Education Education

DEGREES

M.S., Ed.D. Ph.D.

Professors:


Associate Professors:

P. A. Beitel, Ed.D North Carolina (Greensboro); R. Crosby, M.A. Southern Methodist; R. E. Jones (Chairperson), Ph.D. Toledo; N. E. Lay, Ph.D. Florida State; B. J. Mead, Ph.D. Purdue; W. J. Morgan, Ph.D. Minnesota; C. A. Wilsey, Ph.D. Michigan.

Assistant Professors:


The Physical Education Division offers the following degree programs:

- Master of Science degree in Physical Education (thesis and non-thesis programs).
- Doctor of Education degree in Physical Education with concentrations in exercise physiology, motor behavior, adapted physical education, and philosophical and sociological foundations.
- The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 49.

3050 Rhythmic Analysis (2) Emphasis on analysis of organic movement. Prereq: Consent of instructor. A

3090 History of Dance and the Related Arts I (2) Dance history and the arts related to it from beginnings in primitive societies through the nineteenth century. F

3151 History of Dance and the Related Arts II (2) Survey of dance and the arts related to it, tracing their development in the twentieth century. W

3430 Adaptive Physical Education Laboratory (1) Practical work, including student teaching, supplementing 4110. E

4010 Advanced Modern Technique (2) Development, integration, and synthesis of previous dance vocabulary; emphasis on advanced practice and principles. Prereq: 3030. May be repeated. Maximum 6 hrs. Available to dance majors and minors with consent of instructor. F, W

4020 Practicum in Dance Production (2) Prereq: Consent of instructor. W

4060 Advanced Composition (4) Application of compositional, production and administrative skills culminating in presentation of two complete choreographic works. F

4070 Stagecraft for Dance Production (2) Equipment, light design, properties, sets, and stage management.

4110 Adaptive Physical Education (3) Classification of atypical students who require modified programs in physical education activities and class organization suitable for required or special physical education classes. E

4140 Measurement and Evaluation in Physical Education (3) Reliability and measurement and evaluation in physical education. Administration and critique of appropriate measures of physical fitness, sports skills and knowledge. W, Sp, Su
4150 Creative Rhythms for Children (3) Methods and materials for grades 1-6. 3 hrs and 1 lab. F

4880 Motor Behavior: A Theoretical Perspective (4) Examines motor behavior from information processing theories. Prereq: current research to support theoretical base. Prereq: Senior or graduate standing or consent of instructor. F

4980 Motor Behavior Laboratory (2) Beginning experience in methodology and instrumentation for assessing factors related to or affecting motor learning/ performance. Prereq or coreq: 4880 or consent of instructor. Prereq: 4140 and/or 5320 or consent of instructor. W

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree completion. May be repeated. S/NC only. E

5110 Administrative Problems in Health and Physical Education (3)

5120 Problems of the Curriculum in Physical Education (3)

5130 Methods in Physical Education (3) Characteristic of different school age levels, and applications of learning procedures in physical activities at these levels.

5140 Advanced Philosophy of Sport (3) Critical examination of most rigorous and sophisticated aspects of sport during related areas. Prereq: Consent of instructor. W

5150 Systematic Philosophical Analysis of Sport (3) Critical examination of most comprehensive, systematic, and revealing accounts of metaphysical, epistemological, and axiological status of sport. Prereq: Consent of instructor. W

5220 Readings in Physical Education (3) Comprehensive literature in physical education and related areas. Sp

5230 Supervisory Problems in Physical Education (3) For students interested in supervision of physical education teachers.

5310 Analysis of Basic Motor Skills (3) Mechanical analysis of basic motor skills, emphasizing application of these skills to physical education and athletics. W

5320 Seminar in Research Techniques in Physical Education (3) Seminar on application of research techniques in physical education. F

5330 Psychology of Sport (3) Human behavior in sport context. Prereq: General psychology course and consent of instructor. W

5340 Motor Behavior and Skill Acquisition (3) Application of research on human movement behavior to sport and physical education. Prereq: 4890 or consent of instructor. W

5410-20 Specialization Study in a Selected Physical Education Area (1-3, 1-3, 1-3) Advanced comprehensive study in selected specialized area within general fields of physical education. Prereq: Consent of instructor. E

5500 Advanced Kinesiology (3) Action of muscles involved in fundamental movements, calisthenics, sports, and gymnastics. Prereq: 3320 or equivalent. Sp

5510 Selected Topics in Anatomy (3) Intensive study of various systems of human body. Prereq: 5500 or equivalent. May be repeated with consent of instructor. S/NC only. Su

5550 Physical Rehabilitation (3) Physical disabilities and rehabilitation techniques. Prereq: 5500 or equivalent. F

5580 Physical Activity and Health (5) Relationship of physical exercise to longevity, weight control, cardiovascular diseases, low back pain and other disorders, mental health, growth, and aging. Applications for maintenance of health. Prereq: Course in physiology of exercise or consent of instructor. 5 lectures per week. (Same as Public Health 5580.) Su

5600 Applied Physiology (6) Principles of physiology with special emphasis on application of physiological findings to practical problems related to human function. Prereq: 1 yr general chemistry, or consent of instructor.

5610 Advanced Exercise Physiology (4) Principles of energy transfer in humans with special emphasis on integration of organ systems in adapting to requirements of muscular exercise. Prereq: Zoology 4940 or equivalent. Recommended: 1 yr chemistry, physics, and mathematics. 3 hrs and 1 lab. W

5620 Experimental Techniques in Applied Physiology (4) Laboratory exercises in experimental methodology and instrumentation. Respiratory and blood gas analysis, human calorimetry, blood chemistry, and pulmonary function tests. May be repeated with consent of instructor. S/NC only.

5650 Social-Psychological Dimensions of Physical Activity (3) Examination of social-psychological factors which influence performance in physical activity with emphasis on research. Prereq: Psychology 3120 or equivalent. F

5810-20-30 Seminar in Physical Education (1, 1, 1) Current issues and problems in physical education with emphasis on outstanding studies and research in field. E

5910-20-30 Problems and Projects in Physical Education (1-3, 1-3, 1-3) Problems of professional interest and value to the individual student, selected by the student and approved by the major professor. S/NC only. E

6000 Doctoral Research and Dissertation (3-15) E

6010 Seminar in Physical Education (1) Research topics in related to physical education. May be repeated with consent of instructor. S/NC only. E

6220 Independent Research (3) Selection of topic, development of proposal, and completion of research including final writing of research paper. S/NC only. E

6330 Advanced Motor Behavior (3) Theoretical issues of contemporary significance in human motor behavior. Prereq: 5340 or consent of instructor. Sp

6410 Practicum in Kinesiology (3) Electrophysiography laboratory and film analysis of sports skills. Prereq: 5310, 5500 and Physics 2210 or equivalent. May be repeated with consent of instructor. S/NC only.

6510-20 Issues and Problems in Physical Education (3, 3) Critical examination and evaluation of current issues and problems in physical education. W

6610 Seminar in Applied Physiology (2) Prereq: 5610. May be repeated with consent of instructor. S/NC only. F, Sp

6640 Research Participation in Applied Physiologist (1-6) Advanced research techniques under supervision of faculty member whose research area coincides with interests of student. Prereq: Consent of instructor. May be repeated with consent of instructor. S/NC only. F

6810-20 Practicum (2, 2) Intern experience in areas of major interest. S/NC only. E

Division of Public Health

Professor: W. B. Hope, Jr. (Chairperson), MPH, Sc.D., Johns Hopkins

Division of Recreation

Majors: Recreation

Degree: Bachelor of Science in Recreation (thesis and non-thesis programs) with concentrations in general recreation, recreation administration, and therapeutic recreation.

4130 Recreation Administration (3) Introduction to recreation administration, including planning, personnel, areas and facilities, program services, finances, and public relations. Prereq: 3140, 3200, 3880, or consent of instructor. F, W

4200 Survey of Recreation for Special Populations (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special services. Prereq: 3140, 3200, 3880, or consent of instructor. F, Sp

4310 Camp Administration (3) Program planning and organization, personnel management, camp site design, and camp operation for administrators and supervisors.

4500 Specialized Study in a Selected Area of Recreation (1-9) Comprehensive study in a selected specialized area within the broad field of recreation. For recreation students only. Prereq: Consent of division. May be repeated with consent of division. Maximum 9 hrs. E

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree completion. May not be used toward degree requirements. May be repeated. S/NC only. E

5130 Interpretations of Leisure (3) Concepts of leisure including social, psychological, cultural, and philosophical; recreational uses of leisure. Prereq: 3140 or consent of instructor. F

5140 Leisure Service Delivery Systems (3) Variables in leisure services and recreation involved in provision of leisure services for community at large. Prereq: Consent of instructor. F

5150 Current Issues in Recreation (3) Identification and consideration of broad issues--social, environmental, ethical—which currently have greatest impact on use of leisure, and implications for recreation administrator. Prereq: Consent of instructor. Sp

5420 Therapeutic Recreation (3) Role of recreation in lives and treatment of persons with disabilities—mental, physical and medical. Possibilities for helping individuals realize their fullest potential. Prereq: Consent of instructor. W

5250 Implementation of Recreation Services for the Ill or Disabled (3) Policies and functions of management in recreation for ill or disabled in treatment centers and other community agencies. Prereq: 4200 or consent of instructor. Sp

5260 Leisure and Mental Health (3) Relationship between leisure activity and mental health, with emphasis on its use in therapeutic recreation. Prereq: Psychology 3650 or equivalent, and consent of instructor. W

5300 Seminar in Recreation (1) Presentation and general discussion of students' research studies, projects, and thesis in recreation. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. W, Sp

5340 Administration of Recreation Funds (3) Development and management of budgets for recreation agencies with special emphasis on obtaining federal funds appropriated specifically for recreation. Management of revenue received, and exploration of funding alternatives. Prereq: 4130. Sp

5350 Organizational Policies for Recreation (3) Advanced study in the analysis of organizational policies and functions of management in recreation. Prereq: 4130. W

5360 Management and Operation of Recreation College of Education
Facilities (3) Management process as it pertains to operation of recreation facilities. F

5440 Problems and Projects in Recreation (1-9) Individual research on problem of special significance to student. Research projects of limited nature undertaken in lieu of thesis. May be repeated. Maximum 9 hrs. New problem must be undertaken for each repetition. E

5450 Specialized Study in Recreation (1-9) Advanced comprehensive study in selected specialized area within leisure and recreation field. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E
Graduate degree programs of the College of Engineering provide opportunities for advanced study leading to the Master of Science degree, the Master of Engineering degree, and the Doctor of Philosophy degree. For a listing, consult majors and degrees available on page 8.

OFF-CAMPUS GRADUATE INSTRUCTION BY VIDEOTAPE-ELECTROWRITER

Since 1966, the College of Engineering has made use of electronic communication techniques to reach students beyond the confines of Knoxville classrooms. These remotely-taught classes make the specialized talents of engineering college faculty available to students at off-campus centers and industrial sites. This effort makes use of videotapes prepared from a regular on-campus class in specially-equipped classrooms. The tapes contain a visual and audible record of a professor’s lectures and discussions with the on-campus classes and are played back at remote locations. Telephone contact is established periodically between the professor and the off-campus class to allow full discussion and questions. Occasional visits by the professor and the students are made to each remote class and students visit the Knoxville campus at selected times.

Graduate courses have been offered to students at other campuses and established centers of the UT System (Chattanooga, Kingsport, Martin, Nashville, and Tullahoma). Graduate courses have also been made available to engineers in industrial plants. Such courses are also offered to students using classroom facilities at Jackson State and Columbia State Community Colleges.

The remotely-taught courses offered by UTK carry full graduate credit toward the Master’s degree under authorization of the regional accrediting agency, the Southern Association of Colleges and Schools.

YEARN-JAPAN M.S. PROGRAM

This is a unique program allowing American engineering students to develop some understanding, both scientific and cultural, of Japan. It allows an M.S. candidate to obtain a degree from UTK while carrying out research work at a Japanese university. The program requires approximately two years, one year being spent in Japan and the remaining period being spent at UTK to fulfill the course requirements and to write the thesis or project report, as appropriate to the particular department. The program is administered in the framework of each department’s regular graduate program except that the research is done in Japan.

Although the language of communication in Japan would be English, cultural understanding is one of the important objectives of the program and as such a participant would be asked to begin Japanese language study. At the option of the department, up to 6 hours of graduate credit may be allowed for language study, either at UTK or in Japan.

Financial support for living expenses in Japan and for the roundtrip transportation can usually be arranged through fellowships from the Japanese Ministry of Education.

Engineering Experiment Station

W. K. Stair, Director

The Station is organized to conduct investigations in fundamental engineering science and to aid in the development of the state’s resources and industries as far as funds available will permit.

The Station may also make special arrangements with any person or company to study any technical question within the capacity of its resources, and to report the results to the company requesting the study. In such case, the whole expense will be carried by the parties requesting the investigation.

Engineering Administration

MAJOR

DEGREE

M.S.

Engineering Administration

Committee:

A program of study leading to the degree of Master of Science with a major in Engineering Administration is offered. This program is aimed at providing education for graduate engineers in the organization and direction of work in engineering functions, at a level which requires understanding of such areas as marketing, finance, and industrial relations. It should be emphasized that this is an engineering program, aimed at preparing individuals for line management positions in construction, design, development, and manufacturing where both technical and nontechnical factors exert significant influence on the success of a given activity. The program does not provide the opportunity for in-depth study of any of the traditional areas of business administration. Students with such interests are advised to consider graduate programs available in the College of Business Administration.

To be admitted to The Graduate School as a potential candidate for a Master’s degree with a major in Engineering Administration, the applicant must submit reasonable evidence of ability to pursue graduate studies at an acceptable level of performance. In general, the applicant should have graduated from an A.B.E.T. accredited undergraduate institution in engineering with a satisfactory grade point average. In addition, applicants must satisfy one of the following experience requirements: (1) at least two years of engineering experience after graduation if a full-time student or (2) current employment in engineering work if a part-time student.

THE MASTER’S PROGRAM

Minimum requirements for the Master’s
Department of Chemical, Mechanical and Polymer Engineering

Majors

Chemical Engineering

Mechanical Engineering

Polymer Engineering

Professors:

H. F. Johnson (Head), D. E. Yelle, J. C. Boguse, Ph.D.
G. D. Borel, Ph.D.
D. J. W. Weatherly, Ph.D.
L. W. Crawford, Ph.D.

degrees are the satisfactory completion of the following courses:

1. An Engineering Core, 27 hours of graduate credit consisting of Engineering Administration 5900, at least three courses chosen from Chemical Engineering 4150, 5110, 5520, and 5710, and a complement of engineering courses normally selected from the student's undergraduate major department or from courses of other departments pertinent to the program.

2. A Business Administration Core, 15 hours of graduate credit consisting of Accounting 5030, Finance 5010, Marketing 5010, Management 5130, and either Business Law 5310 or Transportation 5210. A student may take both the business law and transportation courses and count one of them as a general elective.

3. General Electives, 9 hours of graduate credit chosen from computer science, economics, engineering, management science, mathematics, psychology, statistics, and other program-related disciplines.

The program requirement totals 51 hours of graduate credit. No extension is permitted. A final oral and written examination must be passed on the work offered for the degree. Course prerequisites for the program are Accounting 2110-20 or 5010, Computer Science 3150, Economics 2110-20-30 or 5010, Economics 5020, Industrial Engineering 4520, and Statistics 3450 or their equivalents.

None of these prerequisites, except Economics 5020, may be counted as part of the 51 hours of credit offered for the degree. These course prerequisites may be waived by the department offering the course upon presentation of evidence of competency in the course content.

5002 Non-Thesis Graduation Completion (3-15)

Required: for the non-thesis student not otherwise registered during any quarter when such a 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.

5900 Project in Engineering Administration

Study and formal report of engineering administration topic, normally performed during last quarter of quarter hour. Required for M.S. in Engineering Administration candidates only. May be repeated. Maximum 3 hrs credit to be applied toward degree. Must register for 5900 until project is complete. S/NC only.

THE DOCTORAL PROGRAM

Students applying for entrance into the doctoral program must display concrete evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence.

Department requirements consist essentially of the satisfactory completion of:

1. Graduate courses in chemical engineering, metallurgical engineering, or polymer engineering amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include:

- chemistry, mathematics, physics, and engineering.
- The comprehensive examination, usually given in two parts, and covering such materials as chemical, metallurgical, and polymer engineering operations and processes, thermodynamics, polymer science and engineering, mathematics, physics, chemistry, and other related fields.
- Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 5010 every quarter offered.
- Reading knowledge of a foreign language relevant to the candidate's research program; selection of language to be made in consultation with the faculty committee. Appropriate languages are French, German, Italian, Japanese, Russian.

UTK-JAPAN COOPERATIVE PROGRAM IN POLYMER ENGINEERING

The UTK-Japan Program provides a means for Japanese research professors to teach part-time in the graduate program, and provides a joint Japanese-UTK program for the admission of Japanese students into the polymer engineering graduate program. A committee of faculty from Japanese universities makes recommendations for students and a UTK committee acts on them.

PROGRAM OPTIONS IN POLYMER SCIENCE AND ENGINEERING

M.S. and Ph.D. degrees with specialization in polymer science and engineering are possible through two routes—one in the department (through chemical or metallurgical engineering) with an engineering emphasis, and a second in a related field in the Chemistry Department having a chemical emphasis.

The specialization program in the department requires, for the M.S. degree, an additional academic program to be specified by the student's committee. M.S. and Ph.D. degrees in the joint specialization program with the chemistry department require a thesis or dissertation in the field. Chemical and metallurgical engineering departmental requirements include completion of Polymer Engineering 4910 and 4920, Chemistry 5531 and 5140, plus active participation in the Polymer Seminar. Ph.D. students must also pass the comprehensive examination in polymer science and engineering, and complete an additional academic program to be specified by the student's committee.

Chemical Engineering

3410 Flow of Fluids (4) Differential and overall momentum balances, mechanical energy balances, flow in tubes, piping systems, and packed beds, metering devices, pumps. Prereq: Chemical and Metallurgical Engineering 3200, Mathematics 2850, 3 hrs and 1 lab.

3420 Heat Transfer (4) Differential and overall energy balances; steady and unsteady state, heat conduction in simple geometries, heat transfer in tubes and heat exchangers; condensation and boiling; radiation. Prereq: 3410. 3 hrs and 1 lab.

3440 Stagewise Operations (3) Analytical and
3450 Diffusional Operations (3) Diffusion, simultaneous heat and mass transfer, applications including concentration, gas absorption, extraction. Prereq: 3450, Chemistry 3440.

3610 Introduction to Process Dynamics and Control (3) Introduction to concepts of process dynamics and control. Steady-state analysis of chemical process control systems. Unsteady state nature of chemical processes. LaPlace transform techniques, block diagram algebra and transfer functions. Mathematical models for several processes are developed and analyzed in detail. Prereq: Mathematics 2840.

3620 Chemical Process Control (3) Basic control theory applied to chemical processes; feed-back control systems, cascade control, feed-forward control, stability analysis, frequency response. Survey of modern control of typical industrial unit operations. Prereq: 3610.

4110 Chemical Engineering Data Analysis (3) Analytical and experimental identification of system extremals; statistical properties of samples and source systems; empirical modeling of processes; statistical process control. Prereq: 3420 and Mathematics 3150.

4120 Probabilistic Chemical Engineering Systems (3) Experiment designs, simulation of stochastic systems, predictive techniques, and analysis of results with applications to process systems. Prereq: 4110.

4130 Introduction to Optimization (3) Principles and applications of optimization techniques to chemical process design; unconstrained optimization, equality constrained optimization, inequality constrained optimization, and dynamic programming. Prereq: Mathematics 2840.


4200 Process Design and Economic Analysis (3) Development of basic information on a process into an integrated plant design considering mass and energy balances, economic implications of design. Prereq: 4110.

4430 Chemical and Physical Properties of Materials (3, 3, 3) Interactions among line functions of typical chemical processes. Prereq: 4420.

4450 Hydrocarbon Processing (3) Study of specific processes for conversion of fossil fuel raw materials and products, and of processes for conversion of fossil fuel raw materials into products of industrial energy, industrial raw materials and consumer markets. Prereq: 3440.

4470 Sulfur Removal from Coal and Associated Problems (3) Chemical and physical properties of domestic coals, sulfur distributions; beneficilization of physical and chemical methods: fluidized bed combustion with both natural and synthetic SOx sorbents; stack gas SOx scrubbing. Prereq: Consent of instructor.

4480 Coal Processing to Liquid Fuels (3) Characterization of various methods; modeling of conversion processes and estimation of maximum yields; water and oxygen requirements; pyrolysis; catalytic hydrogenation; reactor design considerations; review and critique of selected articles from both the current literature and patents. Prereq: Consent of instructor.

4520 Chemical Engineering Reaction Kinetics (3) Chemical reaction rates in closed and flow systems; interpretation of laboratory and pilot plant data; reactor design. Prereq: 3420, Chemistry 3430.

4540 Fluid-Solid Operations (3) Heat and mass transport in fixed and fluidized beds: applications include absorption, on exchange crystallization. Prereq: 3420.

4550 Chemical Process Modeling, Simulation, and Control of Chemical Processes (3) Development of process models, experimental process identification, process computer simulation, conventional and non-conventional feedback control, advanced control concepts. Prereq: 3420, 3450 or consent of instructor.

4730 Mass and Energy Flow in Biological Systems (3) Basic physicochemical and organizational principles applicable to biological systems. Derivations of general mass and energy transfer. Thermodynamics of transport and equilibrium in biological systems. Discussion of Volterra's equation and biological clocks. Prereq: Consent of instructor.

4740 Introduction to Transport Phenomena in Biological Systems (3) Application of principles of transport phenomena to biological systems. Transfer of chemical energy and various cellular active transports; structure and theology of physiological fluids, membrane and interfacial phenomena; analysis and design of artificial organs. Prereq: 3440, 3450 or consent of instructor.

4750 Microbiological Process Engineering (3) Application of chemical engineering principles and design approaches to microbiological processes; continuous culture of microorganisms, food processing and pharmaceutical processes. Prereq: 3440, 3450, or consent of instructor.

4760 Principles of Biochemical Separation (3) Fundamental aspects and similarities of modern biochemical separation methods; classroom demonstrations, design of production and analytical systems. Prereq: Consent of instructor.

4781-B2-83 Topics in Chemical Bioengineering (3, 3, 3) Problems of interest in chemical bioengineering. Prereq: Consent of instructor.

4810-20-30 Special Problems in Chemical Engineering (3, 3, 3) Chemical engineering problems related to recent developments in industrial practice. Prereq: Consent of instructor.

5000 Thesis (1-15) E 5350 Mechanics of Viscous Flow (3) (Same as Engineering Science and Mechanics 5220.)

5000 Thesis (1-15) E

5250 Venture Analysis in the Process Industries (3) Interactions among line functions of typical chemical company in the process industries, introduction to modern kinetic theory and mathematical models to achieve optimum process design and decision in face of external competition. Prereq: 5250.

5310 Thermodynamics of Irreversible Processes (3) Thermodynamic treatment of irreversible chemical processes, transport processes, coupling phenomena, with special emphasis on topics and methods of interest to engineering and bioengineering students. Prereq: 5310.


5610 Stagewise Mass Transfer Operations (3) Equilibrium stage, concepts applied to mass transfer operations, emphasizing nonisothermal and multicomponent systems. Prereq: 5620.

5620 Differential Mass Transfer Operations (3) Differential mass transfer operations, falling film, packed tower and bubble contracting devices; nonisothermal and multicomponent systems; current theoretical approaches to mass and momentum transfer analogies. Prereq: Mathematics 2840.

5810 Mechanics of Viscous Flow (3) (Same as Engineering Science and Mechanics 5220.)

5900 Special Topics In Chemical Engineering (3) Special topics of current interest to chemical engineers. May be repeated. Maximum 9 hrs.

6000 Doctoral Research and Dissertation (3-15) E

6130 Process Optimization (3) Optimization of chemical process equipment and systems by various techniques; static and dynamic systems. Prereq: 5130.

6210 Advanced Diffusional Operations (3) Fixed and fluidized bed operations, stagewise and differential mass transfer bed concepts. Prereq: Consent of instructor.

6250 Chemical Engineering Science and Mechanics 5220.)


6510 Applied Chemical Reaction Kinetics (3) Chemical reactions in gas and liquid phases, heterogeneous catalysis, catalyst effectiveness and role of transport in kinetics. Emphasis on development of phenomenological description although mechanistic models are discussed. Prereq: 5510.


6900 Advanced Topics of Chemical Engineering (3) Heat and mass transfer applied to design chemical engineers. May be repeated. Maximum 9 hrs.

Metallurgical Engineering

3690 Production Metallurgy (3) Thermodynamic and kinetic principles of roasting, smelting, refining, and smelting.
3600 Metallurgical Kinetics (3) Application of principles of chemical reaction kinetics, fluid flow, and heat and mass transfer, to pyro-, hydro-, and electrometallurgical, and nuclear energy processes. Reaction order and basic rate laws; activated complex theory; principles of adsorption and catalysis. Roasting of sulfides; reduction processes; conversions; electrowriting; and leaching. Prereq: 3050; Chemical Engineering 3410 and 3420 or equivalent. 3 hrs or 2 hrs and 1 lab.

3110 Engineering Materials I (4) Introductory course correlating the atomic, crystal, and microstructure of solids with mechanical, physical, and chemical properties of engineering significance. 3 hrs and 1 lab.

3120 Engineering Materials II (3) Extension of 2110 or 3110 with emphasis on control of mechanical properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for mechanical, civil, and industrial engineering students.

3130 Engineering Materials III (3) Extension of 2110 or 3110 with emphasis on control of electrical and magnetic properties of materials by specification of composition, thermal, and mechanical treatment; correlation of resultant properties with service performance. Suggested for electrical engineering students.

3140 Engineering Materials IV (3) Extension of 2110 or 3110 with emphasis on materials processing. Suggested for mechanical and industrial engineering students.

3150 Engineering Materials V (3) Extension of 3110 with emphasis on the mechanisms and control of precipitation and phase transformations in simple and polycrystalline materials, kinetics and thermodynamics of solid reactions, diffusion.

3160 Engineering Materials VI (3) Extension of 2110 or 3110 with emphasis on materials of significance in nuclear engineering; reactor shielding; control through composition, heat treatment and processing equipment. Prereq: Chemical and Metallurgical Engineering 2030.

3220 Diffusion and Annealing (3) Introduction to solid state kinetics; point defects, solid solutions, diffusion equations and mechanisms, annealing of cold worked structures. Prereq: 3210; Mathematics 2840.

3230 Phase Transformations (4) Thermodynamic and kinetic aspects of transformation and equilibration in Ternary systems. Kinetics and morphology of precipitation and phase transformations in simple and complex systems. Prereq: 3220. 3 hrs and 1 lab.

3310 Biomedical Applications of Materials for Life Scientists (3) Principles and applications of engineering materials. Metals, polymers, and ceramics; methods of fabrication of components; corrosion; applications of prosthetic devices and dental materials. Prereq: Chemistry 1110-20 or equivalent.

3520 Materials Behavior and Chemical Process Equipment Design (3) Mechanical, metallurgical, and nuclear reactor consideration of equipment design of chemical processing equipment. Prereq: Chemical and Metalurgical Engineering 2030 or equivalent; 3150; and Chemistry 33 3420. (Same as Engineering Science and Mechanics 3520.)

3710 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of fabrication for ferrous and nonferrous; insulating and semisintered articles; casting, powder metallurgy; plastic forming, joining, heat treatment. Prereq: 2110 or equivalent.

4240 Engineering Materials Design (3) Property control through composition, heat treatment and transformation in ferrous alloys. Plain carbon steels, alloy steels, and tool steel processing for property selection and service requirements. Prereq: 3230 or consent of instructor.

4250 Design and Analysis (3) Design and laboratory sessions on analysis of materials, requirement, and performance in engineering structures and components. Prereq: Senior standing.

4510-20 X-Ray Diffraction and Crystallography (3, 3) Lecture and laboratory work in crystallography, projections, x-rays, diffraction phenomena and techniques, introduction to structure determinations. The first quarter serves as an introduction to the subject. 2 hrs or 1 lab.

4540 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 4540.)

4610 Physical Properties of Materials (3) Electron theory of solids, types of bonding in solids; thermal, electrical, and magnetic properties of materials; relations between mechanical structure and properties of solids. 3 hrs or 2 hrs and 1 lab.

4730 Mechanical Metallurgy I (3) Elastic behavior. Description of stress, strain, and elastic constitutive relations. Effects of composition, microstructure, and loading on mechanical behavior. Failure by yielding. Prereq: 2110 or 3110 or Chemical and Metallurgical Engineering 2030. Suggested for nuclear and engineering science students.

4740 Mechanical Metallurgy II (3) Ductile and brittle fracture, creep and stress rupture, fatigue, and residual stresses. Effects of state of stress, loading rate, time, temperature, and metallurgical structure. Prereq: 3120 or 3230; and 4730 or Mechanical Engineering 3650 or consent of instructor. Also suggested for mechanical engineering, engineering mechanics and engineering science students. 3 hrs or 2 hrs and 1 lab.

4760 Casting and Welding (3) Principles and processes of casting and welding; heat transfer, solidification segregation, gas-metal and slag-metal interactions, thermal treatments, associated stresses. Prereq: 3120 or 3230. 3 hrs or 2 hrs and 1 lab.

4770 Mechanical Metallurgy III (3) Finite plastic strain. Plastic strain-stress relations. Principles of fabrication: forging, swaging, extrusion, rolling, deep drawing. Prereq: 4730 or consent of instructor. Suggested for mechanical engineering, engineering mechanics and engineering science majors. 3 hrs or 2 hrs and 1 lab.

5000 Thesis (1-15) E

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. E

5050 Engineering Analysis (3) (Same as Chemical Engineering 5050.)

5110 Project Defects and Dislocations (3) Theoretical and experimental analysis of point, line, and planar imperfections in solids. Prereq: 4730 or consent of instructor.

5120 Plastic Deformation (3) Geometry and mechanisms of plastic deformation of single crystals; slip and twinning; work hardening; effects of temperature and alloying on short-term loading. Prereq: 5110.

5130 Plastic Deformation II (3) Plastic deformation of polycrystalline materials; theoretical and experimental analysis of texture formation resulting from deformation and annealing. Prereq: 5120.

5140 Diffusion and Annealing in Solids (3) Analysis of models and experimental observations relating to phenomenological and mechanical description of diffusion and annealing of point defects and cold work.

5150 Phase Transformations I (3) Analysis of models and experimental observations relating to phase transformations in simple and polycrystalline materials, solidification, precipitation, spinodal decomposition. Prereq: 5140.


5210-20 Welding Metallurgy (3, 3) Welding processes and physical metallurgy of welding, including power supplies, heat flow, residual stresses, solidification, and solid state reactions, for both simple and complex alloys. Current theories of cold cracking, hot cracking and porosity formation are developed. Prereq: Physical Metallurgy 3140.

5310 Solidification and Crystal Growth I (3) Solubility redistribution, thermodynamic considerations, kinetics, convection and fluid flow effects on the solid to liquid transition. Prereq: Mathematics 4550.

5450-60 Electron Microscopy I and II (3, 3) Kinematic and dynamic analysis of electron diffraction and development of electron microscopes are discussed. Section 1 is given to metallurgical applications such as plastic deformation, fracture, precipitation, and phase transformations. Section 2 is for advanced students.


5750 Corrosion (3) Analysis of corrosion processes in terms of polarization measurements and the Pourbaix diagram. Influence of stress, temperature, and localized conditions contributing to pitting, crevice, and stress corrosion.

6100-20 Special Topics in Metallurgy (3, 3) Lectures and recitation on more recent advances in metallurgy and related fields.

6410-20 Thermodynamics of Solids (3, 3) Phases of solid state physics applicable to metallurgy; elasticity, introductory quantum theory, specific heats, electron theory, electrical and thermal conductivity, magnetic properties, theory of alloy formation. Prereq: 4610 or Physics 3720; Mathematics 4550 and consent of instructor.

6460-20 Rate Process in Metallurgy (3, 3) Theoretical and practical considerations of rate processes in solids such as diffusion, recrystallization and grain growth, and phase transformations.

6520-30 Solidification and Crystal Growth II and III (3, 3) Fluid flow, magnetohydrodynamic effects in incompressible liquid conductors, morphology, stability of steady state coupled heat and mass transfer processes in liquid to solid transition, for both simple and complex solidification, composites, nonsteady state dendritic phenomena, some nucleation phenomena. Prereq: 5310.

6410-20 Thermodynamics of Solids (3, 3) Classical and statistical thermodynamic analysis of stabi-
ity of solid solutions, compounds and ordered phases. Prereq: 5910-20-30 or consent of instructor. 6810 Mechanical and Physical Properties of Crystals I (3) Anisotropic behavior of crystalline materials and techniques of determination. Property classification according to transformation behavior. Prereq: Core curriculum in Metallurgical Engineering and Materials 4050 or 4710 or consent of instructor. 6820 Mechanical and Physical Properties of Crystals II (3) Continuation of Metallurgical Engineering 6810 with emphasis on transport phenomena and irreversible thermodynamics. Prereq: 6810 or consent of instructor. 6830 Seminar in Anisotropic Properties of Crystals (3) Selected topics of current interest in the area of anisotropic behavior of crystalline materials. Prereq: 6810 or 6820, or consent of instructor. May be repeated. Polymeric Engineering 4910 Applied Polymer Science (3) First course in the physical properties of polymers. Polymer structure, crystalline and glass transitions, physical properties of amorphous and crystalline polymers, crystallization kinetics and mechanical properties are discussed. Not for credit for Polymer Engineering majors. 4920 Polymer Processing (3) Rheological properties of polymer melts and solutions, viscometry, unit operations of fiber, plastics and rubber industries. Analytical methods and scale-up, flow through dies and pipelines, screw extrusion, spinning of fibers, injection molding. Not for credit for Polymer Engineering majors. 4930 Principles of Fibre and Textile Engineering (3) Chemistry of the structural and physical aspects of important fibers; melt, wet and dry spinning of manmade fibers; drawing and texturizing; preparation of yarn, dyeing, weaving and knitting. Emphasis on quantitative aspects. 4940 Plastics Fabrication Operations (3) Lecture and laboratory course treating unit operations of the plastics industry. Types and mechanisms of operation of machinery used and the structure and properties of fabricated parts. Operations to include extrusion, coextrusion, injection molding, molding, extrusion, spinning, recycling, and processing particularly extrusion, injection molding. Not for credit for Polymer Engineering majors. 5000 Thesis (1-15) E 5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. E 5050 Engineering Analysis (3) Same as Chemical Engineering 5090.) 5110 Structural Characterization of Polymers with Electromagnetic Radiation (3) Theory of scattering and diffraction of electromagnetic waves by matter, special application to experimental techniques and polymers. Wide angle x-ray scattering (WAXS), small angle x-ray scattering (SAXS), small angle light scattering (SALS). Interpretation in terms of polymer chain conformation, crystal structure, morphology and superstructure. 5120 Characterization of Orientation in Polymer Systems (3) Representation of orientation in matter, characterization using electromagnetic radiation orientation factors. Experimental methods and measurement including birefringence, wide angle x-ray diffraction, and dichroism. Prereq: 5110 or consent of instructor. 5210 Mechanics of Polymer Fluids and Solids (3) Equations of motion and application to polymer melts and glassy and crystalline polymer solids. Non-Newtonian fluid mechanics including viscous flow and lubrication theory, Torsion, bending, and buckling behavior of solid polymers, foams, and composites. Rheo-optical behavior of polymer melts and photoelastic stress analysis. 5230 Mechanical Behavior of Solid Polymers (3) Application of linear viscoelasticity and large deformation elasticity to solid polymers (especially vulcanized rubber and crystalline polymer) properties. Dynamic modulus and loss tangent, wave propagation, friction, tearing, tensile failure, abra- sion. Experimental methods of determining properties. Prereq: Engineering Science and Mechanics 3311. 5310 Polymer Solution Properties and Characterization (3) Molecular weight determination, chromatographic solution thermodynamics, phase separation; application to synthetic and naturally occurring macromolecules. Prereq: Undergraduate physical chemistry. 5410 Rheology and Polymer Processing (3) Methods for determining the rheological properties of polymer melts, solutions and suspensions; linear viscoelasticity, simple nonlinear constitutive relations, viscous heat generation; application to processing particularly extrusion, injection molding, film production. 5450 Principles of Injection and Blow Molding Operations (3) Technology, theoretical analysis of injection mold filling, structure of molded parts; principles of structural foam and sandwich molding; principles of injection molding. Not for credit for Polymer Engineering majors. 5511 Laboratory Methods in Polymer Engineer- ing I (1) Basic experimental procedures for polymer characterization and processing. Prereq: 5210 or consent of instructor. 2 labs. 5512 Laboratory Methods in Polymer Engineer- ing II (1) Basic experimental procedures for polymer characterization and processing, orientation, melt flow, processing. Coreq: 5120 or consent of instructor. 2 labs. 5513 Laboratory Methods in Polymer Engineer- ing III (1) Basic experimental procedures for polymer characterization, polymer melt processing, mechanical behavior of polymers. Prereq: 5410 or consent of instructor. 2 labs. 5610 Textile Processing (3) (Same as Textiles and Clothing 5610.) 5620 Textile Engineering Mechanics (3) (Same as Textiles and Clothing 5620.) 5710 Phase Transformations in Polymer Systems (3) Analysis of nucleation and growth of phases in polymer systems, spinodal decomposition, application to crystallization from the melt, precipitation from solution. 5810 Physical Properties of Polymer Structures (3) Molecular weight and composition distributions in copolymer structures of two phase block poly-ymers and polymer mixtures as related to glassy and crystalline transitions, phase incompatibility, thermal-mechanical and optical properties. 5910-20-30 Selected Topics in Polymer Science (3, 3, 3) Advanced problems in modern polymer research of current interest to engineers. Prereq: 4910, 4920 or equivalent. 6000 Doctoral Research and Dissertation (3-18) E 6110 Optical Properties of Polymers (3) Maxwell's equations and electromagnetic theory of light, optical properties of isotropic and anisotropic dielectrics including theory of birefringence, applications to spherulitic, textures and fibers studies of Stein, light scattering from polymer films. 6150 Advanced X-Ray Diffraction Methods for Characterization of Macromolecules (3) Classical methods of x-ray diffraction; Patterson and Fourier functions; helical nets and Bessel function techniques; levels of order, thermal motions, defects, order-disorder transitions and phase crystallinity. Precision and Weissenberg photography, single crystal and powder diffractometry with applications to synthetic and biological macromolecules. 6210 Nonlinear Viscoelasticity (3) Tensor formulation of constitutive equations of viscoelastic materials subjected to large deformations. Integral, differential, and integral formulations. Applications to polymer flow problems. Prereq: 5210 or equivalent. (Same as Engineering Science and Mechanics 6800.) 6220 Advanced Methods of Polymer Processing (3) Application of theories of rheological properties and processing to analysis of polymer process operations. Prereq: 5210. 6230 Advanced Mechanical Behavior of Polymers (3) Stress analysis with emphasis on developing constitutive equations for yielding behavior of solid polymers, failure analysis and general deformation mechanics of solid polymers. Relation of microsco- pic properties to molecular structure. 6250 Large Deformation Elasticity (3) Curvilinear tensor analysis, theory of finite strains, Mooney- Finger-Rivlin formulation of isotropic non-linear elasticity, solution of large homogeneous and non- homogeneous deformation problems, application to vulcanized rubber, reinforcement with inextensible cords. Prereq: 5230 or equivalent. 6450 Liquid Crystals: Structure, Characteriza- tion, Technology (3) Structure of low molecular weight and macromolecular liquid crystals. Methods of structural characterization. Mechanics of deformation and flow including Freund and Leslie-Enskog theories. Prereq: 5210, 5410 or equivalent. 6610 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of polymer materials; high integrated engineering and chemical approach. Prereq: Consent of in- structor. 6910-20-30 Recent Advances in Polymer Science and Engineering (3) Treatment of latest de- velopments in science and technology of polymers. May include topics of morphology, structure, charac- terization. Prereq: Consent of instructor. Civil Engineering MAJORS DEGREES Civil Engineering M.E., M.S., Ph.D. Environmental Engineering M.E., M.S. Emiritis Professor: G. R. Walker, S. M. Massachusetts Institute of Technology, P.E. Professors: W. L. Grecco (Head), Ph.D. Michigan State, P.E.; E. G. Burdette, Ph.D. Illinois, P.E.; J. W. Forsey, Deans' Professor, School of Engineering, Doctorate, University of Minnesota (Electrical, Computer, and Mechanical Engineering). F. A. Gifford, Ph.D. Pennsylvania State; D. G. Hall, Ph.D. Illinois, P.E.; W. A. Hightower, Ph.D. Northwestern, P.E.; J. B. Humphries, Ph.D. Texas A&M, P.E.; R. A. Minear, Ph.D. Emory, P.E., B. Schantz, D.Sc. New Mexico State, P.E.; F. J. Wegman, Ph.D. Northwestern. Associate Professors: W. S. Boegler, Jr., Ph.D., Purdue; W. F. Brandes, M.S., Illinois, P.E.; M. S. Bronzini, Ph.D. Pennsylvania State, P.E.; A. Chatterjee, Ph.D. Canadian, P.E.; F. N. Gifford, Ph.D. Pennsylvania State, P.E. F. J. Wegman, Ph.D. Northwestern, P.E.; D. G. Kress, Ph.D. Pennsylvania State, A. Moore, M.S. Tennessee; G. D. Reed, Ph.D. Arkansas, P.E.; R. F. Tiry (Emeritus), B.S. Marquette, P.E.; D. W. Weeter, Ph.D. Purdue, P.E. Assistant Professors: G. A. Briggs, Ph.D. (3, 3, 3) Treatment of latest developments in science and technology of polymers. May include topics of morphology, structure, characterization. Prereq: Consent of instructor. The Department of Civil Engineering offers degrees leading to the Master of Science, Master of Engineering, and Doctor of Philosophy with a major in Civil Engineering, concentrating in environmental engineering.
structural engineering, soils engineering and materials, and transportation engineering; and to the Master of Science and Master of Engineering in Environmental Engineering with concentrations in water quality, water resources, and air quality.

MASTER OF SCIENCE PROGRAM

The Master of Science programs in Civil Engineering and in Environmental Engineering are offered to graduates of recognized undergraduate curricula. Departmental requirements provide that for a major in Civil Engineering, the Bachelor’s degree must be in civil engineering, or certain prerequisite prerequisite courses must be taken before admission to candidacy for the Master of Science in Civil Engineering.

CIVIL ENGINEERING

The Department of Civil Engineering offers two options for the Master of Science degree in Civil Engineering.

Option I: A minimum of 45 quarter hours, including at least 9 hours of thesis, is required.
Option II: A minimum of 48 quarter hours, including a 3 quarter-hour special problems is required. The special problem will culminate in a written report which must be approved by the student’s major professor.

ENVIRONMENTAL ENGINEERING

For a major in Environmental Engineering the Bachelor’s degree may be in fields other than civil engineering. In some cases prerequisite undergraduate courses may be indicated, and 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.

Option I: The student must present a minimum of 45 quarter hours of approved graduate courses. The major shall include a minimum of 9 quarter hours of thesis and 18 quarter hours credit of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option II: The student must present a minimum of 48 quarter hours of approved graduate courses. The major shall include a minimum of 27 quarter hours of approved environmental engineering course work. A minor may be selected but is not necessarily required.

Option I or II must be approved by the department.

Normally, the graduate program of study will be adjusted by the head of the department and the student’s committee to suit the individual academic requirements.

MASTER OF ENGINEERING PROGRAM

Graduate programs in Civil Engineering and in Environmental Engineering leading to the degree of Master of Engineering are available to qualified graduates of 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 options noted under the Master of Science programs are available under these programs.

THE DOCTORAL PROGRAM

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

Specific departmental requirements for the Ph.D. degree include the following:
1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis. Of this number, a minimum of 36 quarter hours credit in Doctoral Research and Dissertation will be required.
2. A minimum of 36 quarter hours of graduate courses in the Civil Engineering Department, exclusive of thesis or dissertation credit, at least 9 hours of which must be 6000-level courses.
3. Supporting courses in related scientific and engineering fields, amounting to approximately 36 quarter hours, subject to approval by the student’s faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 12 quarter 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 final examination administered by a faculty committee.

Civil Engineering

4120 Concrete Design (3) Reinforced concrete continuous beams and floor slabs; footings, and retaining walls. Prereq: 4110 and 4410. Sp
4220 Foundations and Substructures (3) Foundations explorations: principles of design of dry and subaqueous foundations. Prereq: 3316. Sp
4240 Structural Design (3) Plate girder, composite steel and concrete beams, connections and details, and design of typical buildings. Prereq: 3230 and 4410. 2.3 hr periods. W, Sp
4250 Photogrammetry (3) Methods of plotting maps from aerial photographs; stereoscopic plotting instruments; applications. Prereq: 2360 or Forestry Summer Camp for Forestry majors. F
4420 Analysis of Framed Structures (3) Maximum stresses due to moving loads; uses of influence lines; lateral forces due to earthquake and wind; analysis of portals, building frames and space frames. Coreq: 4410. W
4430 Construction Methods and Equipment (3) Fundamental operations in construction and selection of equipment; production rates, balancing of equipment, and cost estimates. Prereq: 3710. F, W
4510-20 Advanced Structural Design (3, 3) Plastic design in steel in 4510; design of typical short span steel highway bridges in 4520. Prereq: 3230 for 4510; 4410 for 4520. W, Sp
4530 Cost Comparison in Design and Construction (3) Cost of engineering and construction. Cost comparison of alternate designs with emphasis on applications to civil engineering problems. Prereq: 4430.
4540 Computer Utilization (3) Computer use, economic justification, and extent of use by industry. Utilization of computers for solution of civil engineering problems. Prereq: 3320. F
4550 Engineering Behavior of Soils (3) Plastic and elastic behavior of soils, determination and use of engineering properties of in-situ soils. Prereq: 4220 or consent of instructor. 2 hrs and lab. F
4560 Stabilization of Soils (3) Mechanical stabilization of soils by compaction, drainage, and blending; chemical stabilization of soils with admixtures; waterproofing and modifying soils with additives. Prereq: 4510. 2 hrs and lab. W
4620 Airport Planning and Design I (3) Emphasis on airport master planning. Included for consideration on the air side are runway configuration, capacity, geometrics and lighting; on the land side are included terminal layout and design and ground access systems and parking. Prereq: 3600 and 3610. Sp
4640 Traffic Engineering (3) Characteristics of traffic, roadway and their interrelationship; traffic studies; basic considerations of traffic circulation and control; elements of urban transportation planning studies. F
4660 Airport Planning and Design II (3) Integration and application of principles of airport master planning for purpose of site selection and design of an airport facility through a comprehensive team project, includes environmental evaluation of design. Prereq: 4560. 2 hrs and 2 lab. Su
4710 Portland Cement Concrete Mix Design (3) Properties and tests of portland cement concrete, methods of concrete testing, use of concrete admixtures. Prereq: 3710. 2 hrs and 1 lab. F
4720 Asphalt and Bituminous Concrete (3) Properties and tests of asphalts and asphaltic mixes, mix design of bituminous concretes. Emphasis on use of asphalt in transportation construction projects. Prereq: 3710. 2 hrs and 1 lab. W
4731-32 Earthquake Resistant Structures I, II (4, 4) (Same as Architecture 4731-32.) Su
4800 Introduction to Civil Engineering Systems (3) Methods of modeling civil engineering systems and their specific application to problems of transportation, environment, water resources and materials. Prereq: Senior standing or consent of instructor. Sp, Su
4850 Elementary Structural Matrix Methods (4) (Same as Engineering Science and Mechanics 4850 and Architecture 4850.) Su
4860 Structural Wood Design (3) Application of structural design principles to structural members of various combinations of wood products. Beams, columns, and diaphragm construction with plywood. Various types of fastenings and connections. Prereq: 3230. F
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. 5/NC only. E
5110-20 Statically Indeterminate Structures (3, 3) Deflection of beams and trusses, analysis by force methods and by slope deflection in 5110; analysis by moment distribution and other displacement methods, secondary stresses in 5120. W, F
5140 Statically Indeterminate Structures (3) Analysis of complex planar and space frames. Prereq: 5110 and 5120. Sp
5150 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, stability considerations; stiffness and flexibility analysis of plate trusses, general members and structures composed of general members. Prereq: 4540 or consent of instructor. F
5160 Analysis and Design of Plate Structures (3) Bending and buckling of plates, analysis and design
of bridge and building floors and structural plate components. Prereq: 5110. F

5170 Introduction to Structural Dynamics (3) Analysis of free and forced vibrations, and transient response of structures having many degrees of freedom. Prerequisite: mathematical and structural systems; approximate design methods developed. Prereq: 5120, 5150. Sp

5180 Finite Element Structural Analysis (3) Application of finite element method to structural analysis: plane stress, plane strain, axisymmetric, and three-dimensional elements; use of typical computer programs. Prereq: 5110. Engineering Science and Mechanics 5860. (Same as Engineering Science and Mechanics 5180.) Sp, A

5220 Pavement Design (3) Pavement loads; pavement design; construction practices; and maintenance. Prereq: 5310. Sp

5240 Advanced Properties of Materials: Cement and Concrete (3) Permeability and durability; volume changes and creep; elastic and thermal properties of concrete, special types of concrete; causes of failure. Prereq: 4710. W

5250 Advanced Properties of Materials: Bituminous Substances and Mixes (3) Serviceability concepts; pavement failures and remedies; bituminous pavement mixtures; and other uses of asphalt products. Prereq: 4720. Sp

5270 Planning and Transportation (3) Preparation of transportation and elements of comprehensive development plans. Analysis of relationships between various transportation modes and between transportation and other community features. (Same as Planning 5270.) W

5310 Engineering Practice (3) Valuation and feasibility study; depreciation and useful life; engineering economics. F

5320-30 Engineering Practice Applied to Administration of Engineering Projects (3; 3) Engineering administration; planning of governmental and industrial projects; cost estimates and methods of financing. W, Sp

5410 Construction Contract Law and Administration (3) General principles applicable to construction contracts and construction-related sales contracts. Emphasis on role of engineer in preparation, award, and administration of construction contracts. Case study method of instruction. Prereq: 4230 or consent of instructor.

5420 Structural Model Analysis (3) Experimental methods of shear, moment, and stress analysis.


5460-70 Construction Estimating I, II, III (3, 3, 3) Project costs, estimating techniques; market cost conditions and their influence as it applies to costs. Prereq: 4430 or consent of instructor. W, Sp

5550 Soil Mechanics—Plastic Equilibrium (3) Failure theories; earth pressure analysis, bearing capacity analysis, and slope stability analysis. Prereq: 3310 or consent of instructor. F

5560 Soil Mechanics—Elastic Behavior (3) Stress-deformation characteristics, consolidation, settlement analysis. Prereq: 3310 or consent of instructor. F

5570 Soil Mechanics—Seepage (3) Saturated flow through embankments, filter design criteria, seepage forces and velocities, subdrains, and embankment failures. Prereq: 3310 or consent of instructor. Sp

5610 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading; relation between research results and current specialization for design. Prereq: 3220. W

5730 Prestressed Concrete (3) Properties of prestressed concrete; behavior of prestressed concrete systems; methods of prestressing and posttensioning; analysis and design of members and continuous structures. F

5740 Behavior of Reinforced Concrete Members (3) Ultimate strength and behavior of reinforced concrete members; relation between research results and current specifications for design. Prereq: 4120. W

5750 Urban Systems: Engineering and Management I (3) Management of urban systems usually under city manager and/or city engineer. Organization, finance, personnel administration, purchasing and equipment management and dealing with engineering consultants as each deals with the structure. Prereq: 5150. Civil or Environmental Engineering or consent of instructor. W, A

5805 Urban Systems: Engineering and Management II (3) Continuation of 5800. Management and engineering of urban streets, including lighting, cleaning and snow removal, water supply and waste water drainage, solid waste, air pollution and regulations. Prereq: 5800. Sp, A

5810 Traffic Engineering—Characteristics (3) Driver-vehicle-roadway system; level-of-service concept of capacity. Coreq: Statistics 3450. 2 hrs and 1-2 hr lab. W

5840 Geometric Design (3) Advanced theory and practice in the geometric design of highways. Prereq: 4600. 3 hrs and 1-2 hr lab. W

5850 Functional Design of City Streets and Urban Freeways (3) Effect of street systems upon urban growth and development; classification and function of streets; design features, including cross section, intersections, utility considerations, parking, effect of mass transportation; channelization; marketing; lighting; right-of-way, frontage road, surface street system. Prereq: Consent of instructor. Su

5860 Urban Transportation Planning (3) Prediction of traffic demands and vehicular flows; land use planning; parking needs. Prereq: 5810. F

5870 Public Transit Planning (3) Person movement by bus, rapid rail and taxicab transit. Nature of public transit; its roles and how it fits community’s need; user preferences; modal split models; and computer applications of trip distribution, and trip assignment. Prereq: 4600 or graduate standing. W, A

5890 Traffic Accident Reconstruction (3) Proper accident data collection and analysis as basis for design and operation of street control programs. Many contributing factors to an accident; proximate and secondary accident causes as they relate to roadway improvements. Prereq: 5810 or consent of instructor. Sp, A

5900 Special Problems in Civil Engineering (1-9) To fulfill the special problem requirement in the nonthesis program. Enrollment limited to civil engineering students in non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. N/ SC only. E

5910-20-30 Special Topics (1-6, 1-6, 1-6) Topics related to current developments in civil engineering not included in other courses. May be repeated.

6000 Doctoral Research and Dissertation (3-15) E

6110 Research Development (3) Development of research activities in private and public sectors. Improving skills to become competitive in attracting research funding. Course cannot be used to satisfy 6000-level course requirements in doctoral programs. Prereq: Graduate standing and consent of instructor.

6120 Research Management (3) Management strategies for research programs/projects. Long range and day-to-day management requirements. Course cannot be used to satisfy 6000-level course requirements in doctoral programs. Prereq: 6110.

6610 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: 5170 and 5610. Sp, A

6740 Behavior of Reinforced Concrete Beams and Frames (3) Ultimate strength and behavior of statically indeterminate reinforced concrete systems; applicability of elastic analysis to framed structures; limit analysis. Prereq: 5120 and 5740. Sp


6830 Traffic Flow Theory (3) Queuing theory, Markov processes, Monte Carlo methods, simulations of various conditions and/or designs. Prereq: 4540 or Mathematics 3150. 5820.

6860 Statewide Passenger Transportation Planning (3) Comprehensive multimodal transportation plan, intercity traffic models, functional classification, programming and scheduling. Emphasis on government policies decisions, as they affect air and highway investments. Prereq: 5860. W, A

6870 Future Transit Technology and Research (3) New transit systems and new technology; identification of possible research areas in technology and planning processes and possible research designs. Prereq: 5870. Sp, A

6880 Planning Models for Transportation System (3) Analytical study of trip generation employing mathematical, statistical, and computer science techniques. Modal split, trip distribution, and trip assignment. Statistical procedures integrated into urban transportation planning. Prereq: 5860 or 5270; Mathematics 3150 and Statistics 3450. W, A

6890 Planning Models for Transportation Systems II (3) Analytical study of modal split, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques in modeling process. Models integrated for urban transportation planning process. Prereq: 5860, Sp, A

6910-20-30 Special Topics in Civil Engineering (3, 3, 3) Selected advanced problems of current interest in civil engineering. Prereq: Consent of instructor. E

Environmental Engineering

3000 Introduction to Environmental Engineering (3) Introduction to human interaction with the air, water, and land environment in which one lives; role of engineering in environment, the planning and pollution control aspects of environmental quality. Prereq: 1100. F

4030 Environmental Engineering Chemistry (3) Fundamentals of chemistry which relate to generation, formation, analysis, and removal of environmental contaminants. Prereq: Chemistry 1130 and senior standing. F

4150 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of system constraints and analysis of decision-making process; management of storm water for beneficial use. Prereq: 3330. Sp

4210 Water Resources Engineering Design (3) Elements of water resource structures and systems, including reservoirs, dams, control works, and open channel design. Dam safety control, environmental impact of reservoir projects. Prereq: 3330 or consent of instructor. F

4220 Water Resources Engineering Development (3) Multibjective evaluation procedures for comparing and selecting among water resources development alternatives; formulation of project optimization; single- and multi-purpose projects; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor. W

4300 Hydrologic Design (3) Application of frequency and regression analysis to hydrologic design of water resources systems; substream surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; and effects of land use changes on streamflow quantity and quality. Prereq: 3330. W
5410 Elements of Water and Wastewater Transportation Systems (3) Introduction to theory and design of water transportation and distribution systems, pressure sewer collection systems. Prereq: 3120 and 3330. F, W


5425 Water and Wastewater Treatment Plant Design (3) Detailed process design of water and/or municipal industrial wastewater treatment plants; sludge handling systems, ultimate disposal of residuals. Prereq: 4520 or equivalent.

5430 Environmental Engineering Laboratory (3) Standard analytical techniques for evaluation of specific air, water, and solid waste pollutants. Prereq: 4030. 2 hrs and 1 lab. W

4600 Solid and Hazardous Waste Management (3) Magnitude and characteristics of solids and hazardous waste problems; collection systems; disposal and incineration in urban and industrial systems; environmental controls on fixation, recovery, resource recovery, and proposed new technologies; current and future regulations. Prereq: 4700. Senior standing. F, W, Sp.

4700 Air Pollution—Air Resources Management (3) Introductory course on concepts of air pollution; analysis of relationship among emission sources, meteorology, and atmospheric concentrations; physical, chemical, and biological effects on receptors; engineering approaches for air pollution control. Sp.

4820 Environmental Engineering Law (3) Legal aspects of air and water pollution, drainage, land use controls and environmental impact statements with emphasis upon federal-state relations, recent legislation and court decisions, and enforcement. Prereq: Senior standing. F.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5150 Water and Urban Welfare (3) Social, environmental, and economic impact on planning and management practices of water resources, urban design, and conflict and reconciliation between environmental and development values, measurement of social and economic parameters. Analyzing multioptive policy alternatives with selected case studies. Prereq: Consent of instructor.

5160 Planning and Utilities (3) Planning for adequate water supply and sewage waste disposal in the urban environment. Impact of utility patterns on area development, and problems of utility service policies. Not for civil engineering majors. (Same as Planning 5160). W

5230 Surface Water Transport Processes (3) Dynamics of flow in catchments, streams, lakes and estuaries; Hydrodynamic dispersion, diffusion, boundary layer effects, unsteadiness, kinematic wave approximation. Geometric and hydraulic nomenclature. Prereq: Engineering Science and Mechanics 3110 or consent of instructor. F

5231 Sediment Transportation (3) Sediment properties, bedforms, bed loads and suspended load movement; erosion, scour, deposition and slumping of sediments by flowing water; sedimentation and related topics. Prereq: 5230. W

5234 Flood Damage Reduction (3) Regional, local, flood problems; hydrologic design criteria; traditional flood control measures; land use controls; financial resources; flood losses and insurance, and other flood damage reduction elements; interdisciplinary approach in floodplain management; case studies. Prereq: Consent of instructor. Sp.

5261 Basic Principles of Remote Sensing (3) Applications of remote sensing in agriculture, engineering, forestry, meteorology, land use planning, and resource management; remote sensing electromagnetic radiation including wave theory, physical and geometric optics, and the interaction of EM radiation and matter; concept and applications of handling technology. Prereq: Consent of instructor.

5262 Remote Sensing Data Acquisition (3) Active and passive sensors, their areas of special application and limitation, description of remote sensing platforms, interaction with Environmental Systems, Communication Systems; mission planning. Prereq: 5261 or consent of instructor.


3501 Stormwater Modeling I (3) Interpretation of hydrologic data using methods of system analysis. Models of air and water quality, water resource systems; systems analysis; simplified models and techniques. Prereq: Consent of instructor.


3510 Groundwater Transport Processes (3) Dynamics of flow in porous media with emphasis on physical processes important in submarine hydrology. Hydrodynamic dispersion, anisotropy, layered soli, and unsaturated flow phenomena. Analytical solutions of groundwater flow equations; analog and numerical methods; Hele-Shaw and graphical solutions. Prereq: Engineering Science and Mechanics 3110 or consent of instructor.

3530 Descriptive Hydrology (3) Occurrence and description of elements of hydrologic cycle, effects on earth and relation to humans. Not for civil engineering majors.

4400 Introduction to Environmental Systems (3) Models of air and water quality, water resource systems, solid waste disposal, and location of central facilities. Exposure to current literature on environmental management. Prereq: Environmental Engineering 3400. F

5501 Water and Wastewater Treatment Theory I (3) Theory of unit operations employed in sanitary engineering. Optimization of sewage treatment systems using streamflow simulation techniques. Prereq: Graduate standing, Civil Engineering 4800, or consent of instructor. Sp.

5502 Water and Wastewater Treatment Theory II (3) Theory of physical, chemical, and biological processes employed in sanitary engineering. Prereq: 4520. W


5530 Environmental Engineering and Natural Systems Behavior (3) Seminar in selected issues of environmental engineering science research relating to natural systems behavior. Prereq: Graduate standing or consent of instructor.

5551 Water Quality Management (3) Water quality control objectives for major factors and advanced water quality criteria; effect of various uses on water quality; receiving water characteristics and waste assimilative capacity. Prereq: Consent of instructor. W

5582 Microbiology for Sanitary Engineers (3) Microorganisms and microbiological processes significant in sanitary engineering, including basic microbiology, detection and identification, enzymes and bacterial reactions, energy transfer, synthesis and growth; aerobic and anaerobic biological treatment processes. Prereq: Graduate standing. Sp.

5593 Advanced Environmental Engineering Laboratory (3) Application of modern and traditional methods of environmental engineering to analysis of environmental pollutants. Prereq: 4520. 2 hrs and 1 lab.


5630 Design of Solid and Hazardous Waste Disposal Systems (3) Unit operations and processes for solid and hazardous waste disposal; soil attenuation, incineration and heat recovery, biological processes, fixation and encapsulation, and resource recovery. Prereq: 4520, 5593, 5595, 1 lab.

5700 Planning and Air Pollution Control (3) Relationship between air pollution, area development, and urban growth. Social, economic, and political processes involved in air pollution control.

5710 Air Pollution Control Engineering (2) Emisson control systems for industrial and power generating processes, stack sampling methods, air monitoring, dispersion of pollutants. Prereq: Graduate standing. F, W

5715 Ambient Air Monitoring (2) Physical and chemical techniques for ambient air monitoring. Survey network design. Quality control of air monitoring data. Industrial and area monitoring; application to pollution control. Prereq: Consent of instructor.


5725 Air Quality Modeling and Impact Assessment (3) Techniques to assess the air quality impact on human and natural systems; design and evaluation of mitigation strategies. Prereq: Consent of instructor.

5730 Air Pollution Control Device Design (3) Design and evaluation of systems used to control emissions of gaseous and particle air pollutants. Comprehensive design of specific devices and systems. Prereq: 5720. Sp.

5735 Industrial Source Sampling (3) Sampling methods for gaseous and particulate air pollutant emissions. Prereq: Consent of instructor. Graduation standing; 2 hrs and 1 lab. Su.

5745 Ambient Air Chemistry (3) Reaction mechanisms for production of secondary air pollutants from atmospheric precursors and naturally occurring precursors. Prereq: Consent of instructor.

5760 Diffusion in the Atmosphere (3) Movement and dilution of natural or man-made material released into the atmosphere. Basic theory. Rise of buoyant plumes, relationship between Eulerian and Lagrangian spectra, differences between instantaneous and continuous sources, diffusion in a zone of wind shear and diffusion from urban area sources. Prereq: 5725.

5900 Special Problems in Environmental Engineering (1-9) To fulfill the special problem requirement in non-thesis students, limited to environmental engineering students in the non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

910-20-30 Special Topics (1-6, 1-6, 1-6) Problems and topics of current interest in environmental engineering not included in other courses. May be repeated. E

5990 Environmental Engineering Seminar (1) All papers on environmental engineering, including reports on current research at The University of Tennessee, Knoxville. Course credit not applicable to graduate degree program. Prereq: Active graduate
**Electrical Engineering**

**Majors**

**MAJOR DEGREES**

**Electrical Engineering**

**M.S., M.E., Ph.D.**

**Professors:**

- J. M. Gooch (Head), Ph.D. Georgia Institute of Technology; P.E.; J. A. I. A. Alexandria, Ph.D. Wisconsin, P.E.; J. M. Bailey, Ph.D. Georgia Institute of Technology; A. O. Bishop, Ph.D. Clemson; T. V. Blaock, Ph.D. Tennessee; R. E. Bocenheimer, Ph.D.

**Assistant Professors:**


**Affiliated Professors:**

- J. D. Birdwell, Ph.D. Massachusetts Institute of Technology; J. S. Lawler, Ph.D. Michigan State.

**Master of Science Program**

Graduate work leading to the Master of Science degree in Electrical Engineering may be completed during one academic year of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, who may obtain the Master's degree in one calendar year. Specific departmental requirements include:

1. Electrical Engineering 5070-80 and 5710. Electrical Engineering 5710 is normally available in both fall and spring quarters. Students electing courses such as 5505-60, 5720-30, or 5750-60 which require 5710 as a prerequisite should register for 5710 in the fall quarter.
2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4525, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be approved by the student's Master's committee.
3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in one area of electrical engineering and 9 quarter hours of 5000-level work in another area approved by the student's Master's committee.

**M.S. Degree Requirements**

- 1. Electrical Engineering 5070-80 and 5710.
- 2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4525, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be submitted for the above course material covered in undergraduate work.
- 3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in one area of electrical engineering and 9 quarter hours of 5000-level work in another area approved by the student's Master's committee.
- 4. Master’s thesis, totaling 9 quarter hours or more.
- 5. A final oral examination covering the thesis and related course work.

**Ph.D. Program**

A graduate program leading to the Master of Engineering degree is available to qualified graduates of A.B.E.T.-accredited undergraduate curricula in electrical engineering or its equivalent.

Specific degree requirements which must be met include:

1. Electrical Engineering 5070-80 and 5710.
2. Nine quarter hours of graduate credit in mathematics consisting of Mathematics 4710, 4550, and 4525, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be submitted for the above course material covered in undergraduate work.
3. An additional 18 quarter hours of 5000-level work in electrical engineering or 9 quarter hours of 5000-level work in one area of electrical engineering and 9 quarter hours of 5000-level work in another area approved by the student's Master's committee.
4. The 18 quarter hours of 5000-level work in electrical engineering must be divided equally between two different electrical engineering areas.
5. Master's thesis, totaling 9 quarter hours or more.
6. A final oral examination covering the thesis and related course work.

A minimum of 36 quarter hours of credit in doctoral dissertation.

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. Satisfactory performance on both a basic and an advanced comprehensive examination. The basic examination consists of a 3-hour written examination in each of the following five areas: (1) networks, (2) electronics, (3) electro-magnetics, (4) power, (5) systems and computers. The advanced examination is in the student's major area and is prepared by the student's doctoral committee.

The advanced examination must be passed and a formal dissertation proposal accepted by the student's doctoral committee before the student is accepted as a candidate for the Ph.D. degree. The basic examination is normally taken after the completion of 36 hours of graduate course work. A minimum of 27 hours of graduate work must be completed before the student has taken the basic part of the comprehensive examination the first time.

6. Participation in departmental seminars.

The 72 quarter hours of course work must satisfy the following requirements:

a. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 6000 levels.

b. A minimum of 12 quarter hours of 6000-level course work. At least 3 quarter hours of this work must be in an area other than the student's major area.

c. A minimum of 18 hours of mathematics, including Mathematics (or Physics) 5610-20-30 and 9 hours of mathematics at the 4000 level or above.

Courses required in electrical engineering undergraduate curriculum cannot be used in either the M.S. or Ph.D. programs. In addition, 5000-level courses in electrical engineering may not be used if 5000-level courses are available in the same area.

Many of the electrical engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program.

Departmental graduate programs providing special opportunities for academic and research work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.
76. College of Engineering

3060 Propagation I (3) Propagation of waves in transmission lines and in other guiding systems, impedances and standing waves, standing wave and traveling wave measurements. Introductions to impedance matching, transmission line filtering, antennas, microwave, vacuum tubes, and digital computer design methods. Prereq: 3050. 3 hrs including biweekly lab.

3080 Energy Conversion (3) Magnetic circuits, transmission lines, transformers, principles of electro-mechanical energy conversion with emphasis on input-output characteristics; steady-state analysis of induction motors and d.c. machines. Prereq: 3040. Includes biweekly lab.

3090 Energy System Operation (3) Synchronous machines, transmission-lines, and transformers as power system elements; power system representations, per unit calculations, synchronous components, and fault studies. Prereq: 3060. Includes biweekly lab.


3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Prereq: Mathematics 2850, Physics 2310-30. 3 hrs including biweekly lab.

3120 Basic Electrical Engineering—Electronics (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including biweekly lab.

3130 Basic Electrical Engineering—Machine (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including biweekly lab.

3180 Logic Design of Digital Systems (3) Introduc- tion to boolean algebra and design of combinational circuits. Presents gate and flipflop characteristics. Design of clocked sequential circuits and other systems containing memory. Introduction to minicomputer architecture and system components to include basic arithmetic, control, storage, input-output, and control systems. Instruction set capabilities and machine language programming. Prereq: 3101, Computer Science 3150. 3 hrs including biweekly lab.

3190 Plasma I (3) Engineering applications of physical electronics, plasma effects and devices. Topics include electrostatic precipitators, light scattering, plasma applications and applications (e.g. plasma tubes will be given. The last third of the course will introduction to feedback theory; stability criteria. Prereq: 3010 and Mathematics 3150. Coreq: 3180. 3 hrs including occasional labs.

3810 Basic Electronics I (3) Band theory fundamen- tals; theory and applications of p-n junctions; simple power supplies; theory of operation of field-effect transistors and applications in simple circuits. Coreq: 3020. 3 hrs including project laboratory.

3820 Basic Electronics II (3) Physical operation of bipolar transistors and vacuum tubes with applications in basic amplifiers. Integrated circuit fundamentals. Prereq: 3810. 3 hrs including project laboratory.


4020 Direct Electrical Energy Conversion (3) Basic principles, typical devices and applications for propulsion, lighting, heating, etc. by thermoelectric effects, thermionic conversion, magnetohydro-
5230 Advanced Electrical Machinery Applications (3) Linear motors; pole amplitude modulation and other speed control techniques; variable frequency systems.

5240-50-60 Control Systems Design I, II, III (3, 3, 3) Analysis and design of continuous and digital control systems using classical and modern techniques. Feedback control system design, stability analysis, system response analysis; design of estimator and observer; system compensation. Emphasis on engineering examples of control systems. Coreq: 5707 or equivalent.

5271 Modern Systems Theory I (3) Introduction to linear systems theory. State-space model, linear dynamical system, state transition map, matrix exponential, controllability, observability, realization theory, pole placement, observers, stability theory for linear systems. Prereq: Consent of instructor.

5281 Modern Systems Theory II (3) Optimal estimation theory. Probability theory and stochastic processes, uncertain dynamical systems, estimation and filtering theory. Wiener filtering, the Kalman filter and its extensions. Prereq: 5271 or consent of instructor.

5291 Modern Systems Theory III (3) Optimal control theory. Deterministic optimal control theory, minimum principle, Hamilton-Jacobi equation and dynamic programming, control theory, stochastic dynamic programming, dual control problem and separation principle, linear quadratic Gaussian control, cost function uncertainty and stability. Prereq: 5271, 5281 or consent of instructor.

5310 Basic Requirements for Plasma Fusion (3) Historical and physical fundamentals. Lawson criterion, break-even criterion. Inertial fusion systems—hydrogen bomb, laser fusion, and electron-beam fusion. Magnetically-confined plasma systems, tokamak, mirror system, and exotic systems. Confinement, stability, and heating. Possibility of fusion-fission hybrid systems. Prereq: Consent of instructor or plasma engineering or plasma physics background or employment in fusion work.


5330 Engineering of Fusion (3) Materials in a thermonuclear environment. Magnetic field production. Divertor surface. Divertor and magnet geometry. Radiological safety. Cost of controlled fusion power. Prereq: Consent of instructor or plasma engineering or plasma physics background or employment in fusion work.


5350 Properties of Quantum Devices (3) Optical resonant cavity theory and design; steady-state and Q-switched operation of mode-locked oscillators. Modulation and stabilization techniques. Laser output power spectral line shape and noise considerations. Operational characteristics of {\gamma}_\text{H}, maser, and ruby, plasma, and semiconductor diode lasers. Prereq: 5340 and Mathematics 4710 or equivalent.

5360 Application of Quantum Electronic Devices (3) Coherence properties of laser radiation and "beat-frequency" experiments. Lasers in communication and instrumentation systems. Specific application includes: complex, plasma diodes, Raman emission spectroscopy, optical harmonic generation, holography, metal-working, and biological and medical applications. Prereq: 5340 and Mathematics 4710 or equivalent.

5370 Advanced Direct Electrical Energy Conversion I (3) Theory, latest devices, and applications for production of electrical energy by solid state means of thermoelectric and photovoltaic effects. Prereq: 4602 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5380 Advanced Direct Electrical Energy Conversion II (3) Theory, latest devices, and applications for production of electrical energy by solid state means of thermoelectric and photovoltaic-effect devices, and electrodynamic devices. Prereq: 4602 or Mechanical Engineering 4150 or consent of instructor.

5390 Advanced Direct Electrical Energy Conversion III (3) Theory, latest devices, and applications for production of electrical energy by solid state means of thermoelectric and photovoltaic-effect devices, and electrodynamic devices. Prereq: 4602 or Mechanical Engineering 4150 or consent of instructor.

5410 Power System Networks (3) Sequence impedances for transmission lines, machines, and transformers. Formation of system network characteristics such as Zbus, Ybus, and others. Computer methods. Prereq: Graduate standing or consent of instructor.

5420 Fault and Load Flow Studies (3) Analysis of power system under normal and short-circuit conditions. Computation methods for fault studies. Load flow problem formulated with computer methods emphasized. Prereq: 5410 or consent of instructor.


5440 Distribution System (3) Electric power distribution systems. Analysis and design of power distribution systems. Power system growth, planning, operation and regulation. Prereq: 4410, 4420, 4430 or equivalent.

5460 Selected Topics in Power Systems (3) To meet special needs of students. Possible topics: power systems reliability, interconnected system theory, power plant operation, electrical transients in power systems, and power system stability. Consent of instructor. May be repeated with consent of department.

5510-20-30 Advanced Analog Electronics (3, 3, 3) Physical operation of modern electronic devices with emphasis on semiconductor devices such as diodes, bipolar transistors, J-FETs, and MOSFETs. Small-signal equivalent circuits and noise models of active devices. Design and analysis of linear wide-band low-noise feedback amplifiers and radio-frequency amplifiers using discrete, monolithic and hybrid devices; voltage and current regulators, including switching regulators. Use of specialized electronic systems in analog signal processors. Advanced techniques in analog circuits for precision data conversion. Prereq: 4370, 4600, 4680, 4740 or consent of instructor. Coreq: Calculus Math 4510 or 4710. Project laboratory included.

5540 Thick-Film Hybrid Microcircuits (3) Processes and designing methods for prototype production of hybrid thick-film integrated circuits. Effect of surface-thermistor and temperature. Computer methods for fault analysis and fault simulation. Prereq: 4602 or consent of instructor.

5570-80-90 Advanced Electrical Engineering Topics (3, 3, 3) Switching circuits using active devices in discrete, monolithic, and hybrid configurations; clipping and clamping circuits, negative resistance circuits, comparators, time-base generators, sweep circuits, blocking oscillators, analog switch logic families, registers and counters, analog-to-digital and digital-to-analog converters, and digital signal processors. Prereq: 4740 or consent of instructor. Project laboratory included.


5615-25 Introduction to Switching Theory and Logical Design (3, 3) Boolean algebra and applications. Combinational switching circuits. Sequential switching circuits. Computer science major and those without prior experience in mathematics and logic design. Prereq:
Wave propagation in isotropic and anisotropic media, transmitted power, stored energies, propagating and nonpropagating modes, orthogonality properties, the theory and radiation conditions, sources. Prereq: 5820.


5930 Digital Image Processing (3) Theory and techniques. Visual system models, two dimensional sampling and interpolation, image representation and transforms, image enhancement, restoration, reconstruction, image coding techniques, image de- tection, scene analysis and scene matching. Pre- req: 4830 or consent of instructor.

5940-50 Advanced Small Computer Systems (3, 3) Real-time applications, memory and CPU orga- nization, interface software, and peripheral devices of minicomputer and microprocessor system are studied. Project-oriented supported by hardware and software interface design. Prereq: 4850 or equiva- lent or consent of instructor. (Same as Computer Science 5940-50.)


6100 Electromagnetic Wave Propagation (3) Wave propagation in isotropic and anisotropic media, transmitted power, stored energies, propagating and nonpropagating modes, orthogonality properties, the theory and radiation conditions, sources. Prereq: 5820.


6240-50-60 Advanced Systems Theory I, II, III (3, 3, 3) Advanced topics in modern theory. Topics vary: 6240—Game theory, dual control problem, informa- tion theory and control systems, reliable control. 6250—Algebraic and geometric systems, theory, systems defined on groups. 6260— Qualitative analysis of systems, nonlinear systems analysis, stability theory. Need not be taken in sequen- ce. Prereq: 5271-81-91 or consent of instructor.

6270-80-90 Special Topics in Systems Methodol- ogy (3, 3, 3) Special topics of current interest to sys- tem analysts and engineers. Discussion of new developments as found in current literature. Prereq: Consent of instructor.


6500-10 Electrical Conduction in Gases and Plas- ma Physics (3, 3) Advanced topics of current interest to system analysts and engineers. Discussion of new developments as found in current literature. Prereq: Consent of instructor.

6530 Special Topics in Image and Pattern Analy- sis (3) Discussion of new developments as found in current literature. Prereq: 5670-80 (Computer Scien- ce 5840-50) and 5830 or consent of instructor.


6650 Advanced Antenna Theory (3) Cylindrical dipole. Hallen’s equation. King’s integral equation, current distribution, terminal impedance, and mutual impedance between several dipoles. Prereq: 5810- 20 and Mathematics 4250 and 4550.

6660 Electromagnetic Diffraction and Scattering (3) Diffraction of electromagnetic waves by spheres and cylinders, ground wave propagation problem, methods, approximate methods, creeping waves. Pre- req: 5810-20 and Mathematics 4250 and 4550.


6870 Coding Theory (3) Mathematical structure of algebraic and probabilistic codes. Coding metrics and bounds, linear codes, linear feedback shift regis- ters and convolutional codes, burst-correcting codes and decoding methods. Prereq: 5710 or con- sent of instructor.


Engineering Science and Mechanics

MAJOR

DEGREES

Engineering Science

M.S., Ph.D.

Professors:

W. T. Snyder (Head), Ph.D. Northwestern;

J. E. Akin, Ph.D. Virginia Polytechnic Institute, P.E.;

A. J. Baker, Ph.D. New York; T. G. Carley, Ph.D.

J. H. Forrester, Ph.D. Iowa State, P.E.; C. W. Lee,

P.E. Ohio State, P.E.; J. E. Stoneking, Ph.D.

Associate Professors:

R. M. Johnson, Ph.D. Virginia, P.E.;

K. H. Kim, Ph.D.

Mathews, Ph.D. Illinois, P.E.; T. F. Moriarty, Ph.D. Illinois,

Ph.D. Tennessee; L. R. Shobe, (Emeritus) M.S.

Kansas State, P.E.; E. Stoneking, Ph.D. Illinois, P.E.;

D. G. Thomas, Ph.D. Ohio State, P.E.

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 options include solid mechanics, fluid mechanics and biomedical engineering. In the biomedical and engineering science option, interdisciplinary programs are arranged to meet individual needs or interests. Each applicant will be advised as to any prerequisite courses before entering a program; the student’s program 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.

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 options 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. plans are offered: Plan I requires a thesis, while Plan II does not. The second plan is offered to meet the needs of engineers employed in industry, or those who plan to teach in community colleges and technical institutes. It will be available, however, to any student who, in the opinion of his/her advisory committee, can benefit from additional coursework beyond that required for a thesis.

In Plan I a minimum of 45 quarter hours, including the thesis, is required. In Plan II a minimum of 48 hours is required. The requirements include the following:

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Plan I</td>
<td>Plan II</td>
</tr>
<tr>
<td>Mathematics</td>
<td>9</td>
</tr>
<tr>
<td>Engineering courses</td>
<td>18</td>
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</tbody>
</table>

(Major option; may include but is not restricted to courses offered by the Engineering Science and Mechanics Department.)

Related courses (May include additional courses in mathematics, computer science, or the physical and life sciences as well as engineering courses.)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Credit</th>
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<tr>
<td>Theory</td>
<td>9</td>
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A final examination is required under both plans, covering graduate course work and the thesis (if any).

**THE DOCTORAL PROGRAM**

General policies and requirements of The Graduate School relating to admission, residence, languages, research, examinations, faculty advisory committee, and admission to candidacy apply to this program. Specific departmental requirements for the Ph.D. degree include:

1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the Master's thesis. These shall include a minimum of 36 quarter hours credit in Doctoral Research and Dissertation and a minimum of 72 quarter hours credit in other courses.

2. A minimum of 36 quarter hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 5000 and above, with at least 12 quarter hours of 6000-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 18 quarter hours in mathematics or computer science in courses numbered 4000 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 9 quarter hours of courses numbered 4000 and above, offered in departments other than mathematics, computer science, and the student's major department and which are not included in the areas of concentration selected by each student under item 2.

5. Active participation in graduate seminars and colloquia.

6. Comprehensive examination consisting of a written qualifying examination and an advanced examination. The qualifying examination covers areas of engineering science and mathematics, for the most part at a level and scope expected of well-qualified recipients of a Bachelor's degree in engineering. The advanced examination requires demonstration of special competence in the areas of concentration selected by each student under item 2.

7. Submission of a written proposal for dissertation research to the student's advisory committee. Oral defense of the proposal is normally required when the student takes the advanced portion of the comprehensive examination.

8. Submission of a dissertation which meets the requirements of The Graduate School, the department, and the student's advisory committee.

**3311 Mechanics of Materials (4)** Concepts of stress and strain; stress-strain relations and Mohr's circle; static analysis of members; area moment of inertia; stress and displacement analysis of axially-loaded members; torsion; bending. Not for departmental graduate credit. Prereq: Basic Engineering 1310. Coreq: Mathematics 2850.

**3410 Introduction to Biomedical Engineering (4)** Designed to introduce the facets and opportunities of biomedical engineering, and to provide basic terminology and background knowledge for further courses in the field. Subjects include anatomy, physiology, bioengineering, and general systems. Coreq: Mathematics 2840 or consent of instructor.

**3420 Introduction to Clinical Engineering (3)** Application in clinical/hospital setting: description, analysis, and design of health care delivery systems; hospital organization and structure; clinical use of biomedical equipment; principles of safety engineering in the hospital and applicable codes, standards, and regulations. Prereq: 3410, Physics 2320, or consent of instructor.

**3520 Materials Behavior and Chemical Process Design (3)** (Same as Metallurgical Engineering 3520).

**3700 Dynamics (4)** Kinematics of rigid bodies; mass moments of inertia; coulomb friction; kinematics of rigid bodies using force, mass, acceleration, work-energy, impulsive-momentum. Not for departmental graduate credit. Prereq: 2705 or Basic Engineering 1320. Coreq: Mathematics 2840.

**3710 Intermediate Dynamics (3)** Three-dimensional dynamics of particles and rigid bodies; dynamics of bodies with varying mass; central force motion; LaGrange's equations. Prereq: 3700, Mathematics 2840.

**4020 Computer-Aided Design (3)** Use of computer graphics and analysis programs for design of selected systems, structures, and components. Evaluation of design alternatives. Prereq: 4810.

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*Engineering courses under Plan II may include advanced laboratory work or special project work, for example, Engineering Science and Mechanics 5910 or analogous courses in other departments.

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**4430 Orthopedic Biomechanics (3)** Introduction to engineering principles and applications in orthopedics and rehabilitation. Statics, Newton's laws of motion, statics and dynamics of particles, mechanical properties of engineering materials, biological materials. Prereq: Consent of instructor. For non-engineering majors.


**4520 Biomedical Fluid Mechanics (3)** Discuss objectives, review foundations and present development in biomedical and fluid mechanics. Properties of human blood and blood vessels, determinants of cardiac performance, analysis and measurement of flow and pressure in arteries, nontraumatic study of circulatory system, mechanics of microcirculation. Applications to areas of hemolysis, thrombosis, and fluid dynamics of heart assist devices. Prereq: 4500 or a course in fluid mechanics or consent of instructor.

**4530 Biomechanics (3)** Discuss objectives, review foundations and present development in areas of multidisciplinary study. Concepts, statics, vibrational theory, continuum mechanics, properties of human blood and blood vessels, determinants of cardiac performance, analysis and measurement of flow and pressure in arteries, nontraumatic study of circulatory system, mechanics of microcirculation. Applications to areas of hemolysis, thrombosis, and fluid dynamics of heart assist devices. Prereq: 4500 or a course in fluid mechanics or consent of instructor.

**4540 Fracture-Safe Design (3)** A critical review of mechanical properties of materials that are indicative of fracture resistance in anomalous loading. Fracture mecha-

nism. Prereq: 3310 and Metallurgical Engineering 2110. Coreq: 4500. 3 hrs or 2 hrs and 1 lab.

**4850 Principles of Nondestructive Testing (3)** (Same as Physics 4580.)

**4860 Experimental Stress Analysis (3)** Basic concepts: theory, techniques, and instrumentation of resistance strain gage technology; introduction to other stress analysis methods. Prereq: 3310 and Mechanical Engineering 2110. Coreq: 4500. 3 hrs or 2 hrs and 1 lab.

**5620 Dynamic Data Acquisition (4)** Instrumentation of measuring systems for dynamic events and responses; signal conditioning, oscilloscopes, and magnetic tape recording; telemetry and data transmission; data processing. Prereq: 2705, Electrical Engineering 3120. 3 hrs and a 3-hr lab.

**5630 Introductory Photomechanics (3)** Introduction to photoelasticity, photoelastic coating method. Moire method, interferometry, and holography. Prereq: 3310, Physics 2320. 2 hrs and a 3-hr lab.


**5810 Engineering Analysis (4, 3)** Integration of fundamental physical laws and mathematical methods of analysis with emphasis on application to realistic engineering problems. Prereq: 3310, 3311, and Mathematics 3150.

**5850 Elementary Structural Matrix Methods (Same as Civil Engineering 4850 and Architecture 5850.)

**5910 Special Engineering Science Topics (3)** Problems related to recent developments and practice. Open to juniors or seniors with consent of instructor. May be repeated. Maximum 6 hrs.

**5000 Thesis (115) E**
5002 Non-Thesis Graduation Completion (3-15)
Required for the non-thesis student not otherwise
registered during any quarter when such a student
wishes to continue study or pursue research degrees.
Prereq: S/NC only. E

5110-20 Fluid Dynamics (3, 3) Kinematics of fluids,
vorticity, rate deformation, plane and axially symmet-
ric stream functions; Navier-Stokes equation, exact
solutions, creeping flow and boundary-layer approx-
nimations; viscous flow, potential theory, complex
potentials, conformal mapping. Prereq: 5800.

5130 Introduction to Turbulence (3) Macroscopic
effects, analogies, statistical treatment, correlation

5140 Finite Element Methods In Fluid Mechanics (3)
Computational fluid mechanics using finite ele-
ment techniques. Basic methodology; initial-value
tasks; matrix interaction; accuracy and con-
vergence concepts. Laminar and turbulent boundary
layer flow; inviscid and aerodynamic flows; incom-
pressible and compressible viscous flows, turbulence
and separation and recircu-
culation. Prereq: 5110 and 5800.

5180 Finite Element Structural Analysis (3) (Same as
Civil Engineering 5180.)

5220 Mechanics of Viscous Flow (3) Viscous
forces in flow phenomena; application of Navier-
Stokes equation to problems of flow; stress-optic
methods of laminar flow analysis. Prereq:
Mathematics 4610. (Same as Chemical Engi-
neering 5180.)

5310-20 Advanced Mechanics of Materials (3, 3)
A survey of mechanics of materials: elementary
theory of elasticity. Prereq: 3311 and
Mathematics 4610.

5410-20 Theory of Elasticity (3, 3) Stress, strain
in three dimensions; linear elasticity; bending of prismatical
bars; axisymmetric stress distribution; stress con-
centration; plane stress, plane strain. Prereq:
5800.

5430 Thermal Stresses (3) Heat conduction;
thermoelastic equations; thermal stresses in beams, rings,
plates, and shells; thermal buckling problems. Pre-
req: 5410 or 5310-20-30, and Mechanical Engineer-
ing 5440.

5440 Theory of Linear Viscoelasticity (3) Linear
viscoelasticity of solids; quasistatic problems; vibra-
tions; problems; dynamic problems; stability prob-
lums; foundations of three-dimensional linear vis-
coelasticity. Prereq: 5800.

5550 Fracture Mechanics (3) Equilibrium and
kinematic methods for deter-
mination of fracture mechanics parameters. Prereq:
5800; Mechanical Engineering 4730 or Mechanical
Engineering 5540.

5630-40 Photoelasticity (3) Physical optics, wave
motion, polarized light, basic principles of photoelas-
ticity, equipment, and techniques; application to two-
dimensional problems; theory and stress concentra-
tion; numerical methods in photelastic stress analysis;
photelastic coating methods, three-dimensional photelasticity.
Prereq: 3311, Mathematics 4610,
and consent of instructor. 5640: 2 hrs and 3 labs.

5710-20 Advanced Dynamics (3, 3) Physical laws
relative to translating and rotating reference frames;
rigid body dynamics; variational methods; La-
Grange's equations; Hamilton's principle. Prereq:
3710 or 4710, Hamilton's principle. E

5730 Advanced Vibrations (3) Vibrations of multi-
ple degree of freedom lumped parameter systems. Iterative
and approximate solutions. Introduction to random vibrations.
Prereq: 4710 and 4850.

5740 Vibrations of Continuous Media (3) Equa-
tions of motion for strings, rods, beams, membranes,
plates, and shells, natural modes and frequencies; re-
sponse of damped and undamped components to
applied dynamic loads; approximate methods of
solution. Prereq: 5410 and Mathematics 4550.

5750 Orbital Mechanics (3) Planetary, satellit-
e and astronomical orbits and trajectories; orbital perturba-
tions; classical principles of minimization. Prereq: 3710 and 4710.

5800 Introduction to Continuum Mechanics (3)
Fundamentals of mechanics of solids and fluids;
Conservation theorems, flow, and energy
in continuous medium; constitutive equations, applica-
tions to solids and fluids. Prereq: 3130 and 3311 or equivalents. Mathematics 4610.

5840 Perturbation Methods in Mechanics (3) Reg-
ular and singular perturbation methods for solution of
linear and nonlinear differential equations. Problems
in solid mechanics, fluid mechanics and dynamics.
Prereq: Mathematics 4650.

5850 Introductory Finite Element Methods (3)
General finite element procedure; convergence re-
quirements; programming concepts. Stress analysis,
heat transfer, fluid flow, and solution of differential
equations. Prereq: 5800 or 5310, or Mechanical
Engineering 5540, or consent of instructor.

5910 Special Topics in Engineering Mechanics (3)
Mechanics problems related to recent develop-
pments; current research and recent publication.
May be re-
peeled with consent of department.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Advanced Topics In Fluid Mechanics and
Convective Transfer (3, 3) Survey of literature on
advanced convective momentum, heat, and mass
transfer; basic principles of Navier-
Stokes equations; boundary layer stability analysis;
phenomenological theories of turbulence; turbulent
boundary layer flow; high speed flow of phenomena
in nonreacting and reacting systems. Prereq: 5110-
2540 or equivalent; Mathematics 4610, 4540-50,
4710. (Same as Environmental Engineering 6110-
20.)

6140 Advanced Finite Element Methods In Fluid
Dynamics (3) Computational fluid dynamics using
finite element methodology. Formulation for two-and
three-dimensional, multiphase compressible flows,
second-order turbulence closure; parabolic Navier-
Stokes equations, Multidimensional, turbulent,
and reacting flows. Prereq: 5130 and 5140.

6230-40-50 Theory of Turbulence (3, 3, 3) Mathe-
ematical description of turbulence; isotropic tur-
bulence, energy spectra, Kolmogoroff's hypothesis;
large and small eddy structure by turbulent flows;
turbulent diffusion by continuous movement; ap-
plications to turbulent jets, wakes, pipe flow, and
boundary layers. Prereq: 5110-20-30. Coreq:
Mathematics 5610-20-30.

6310 Theory of Plates (3) Classical theory of bend-
ing of plates of various shapes; thick plates; plates of
generally variable thickness; buckling and large deflection

6320 Analysis and Design of Thin Shell Struc-
tures (3) Geometry of surfaces, derivation of thin
shell theory of stiffness and strength for structural
engineer. Prereq: 6310 or Civil Engineering 5160.

6330 Theory of Elastic Stability (3) Theory of elas-
tic stability of prismatic bars, rings, plates, and

6340 Theory of Plasticity (3) Yield conditions;
strain hardening; general constitutive equations; plastic
potential; uniqueness theorems; extremum
and variational problems; problems in perfectly plas-
tic solids; finite plastic deformations; piezoelectric;
linear plasticity. Prereq: 5410 and Mathematics
4550.

6610 Photoelasticity (3) Stress-optic law in three
dimensions and index ellipsoid, rotational effects in
three-dimensional photoelasticity, techniques and
applications of three-dimensional photoelasticity,
scattered light method, dynamic photoelasticity,
photothermoelasticity, plasticity and photovis-
coelasticity, recent developments in photoelasticity.
Prereq: 5640, 5420 and consent of instructor. 2 hrs
and 3 labs.

6710 Impact and Stress Waves In Solids (3)
Mechanical impact; wave propagation in elastic
solids; impact and waves in elastic rods, beams, and
plates; contact of elastic bodies; dynamic loading in viscoelastic and plastic materials;
dynamic properties and materials. Prereq: 5410.
Coreq: Mathematics 5630.

6800 Nonlinear Viscoelasticity (3) (Same as Po-
ey Engineering 6210.)

6810 Energy Methods (3) Virtual work, minimum
potential energy, and variational principles. Cast-
igian's theorems, Hamilton's principle, and La-
grange's equations of motion; variational methods;
examples from the theory of structures, plates and
shells, buckling, vibrations, and advanced dynamics.

6910 Special Topics In Engineering Mechanics (3)
Advanced problems of interest in mechanics,
work either as group or individually. Prereq; Con-
sent of instructor. May be repeated with consent of
department.

NOTE: Not all of the above courses will be offered in any one
year.

Industrial Engineering

MAJOR

DEGREES

M.S., M.E.

Professors:
  J. N. Snyder (Head), Ph.D. Ohio State; P.E.,
  D. C. Dougal, M.S. Tennessee, P.E.; H. P. Emerson
  (Emeritus), S.B. Massachusetts Institute of
  Technology, P.E.; R. M. Laforge, (Emeritus), M.S.
  University of Wisconsin, P.E.;
  W. D. VanSlyke, Ph.D. Virginia Polytechnic Insti-
  tute, P.E.;
  W. G. Sullivan, Ph.D. Georgia Institute of
  Technology, P.E.

Assistant Professors:
  F. K. Boyce, M.S. Tennessee; W. W. Claycombe,
  Ph.D. Virginia Polytechnic Institute, P.E.,
  E. E. DePorter, Ph.D. Virginia Polytechnic Institute;
  D. H. Hutchinson, Ph.D. Georgia Institute of
  Technology; W. A. Lyday, M.S. Tennessee.

The MASTER'S PROGRAM

A graduate program leading to the degree of
Master of Science is open to graduates of
recognized undergraduate curricula in industrial engineering or to graduates of other
engineering curricula who take up to 15
quarter hours of prerequisite course work.
A non-thesis option with 45 hours of course work
plus a 3-hour design project is available.
Graduates have a variety of career options
available.

Graduates may be elected in Engineering,
Mathematics, Psychology, Business, Computer Science,
Statistics or Economics.

MASTER OF ENGINEERING PROGRAM

This professional degree program is intended as a culmination year in a five-year
baccalaureate-master program which
emphasizes engineering design and professional practice. Admission
requirements include those presented above
plus the requirement of a Bachelor's degree from an A.B.E.T.- accredited engineering
program. This 45-quarter hour program
requires 18 hours of course work in an
industrial engineering core, 9 hours of
technical methods electives, 9 hours of
industrial engineering design electives and
9-hour thesis or design project.

Any 4000-level course required in the
Bachelor of Science in Industrial Engineering
program at The University of Tennessee may
4040 Manufacturing Materials and Processes (3)

4060 Production Systems Planning and Control I (3)
Theory and applications of forecasting, production planning, inventory analysis, planning and control, and systems design and implementation. Not available for graduate credit for industrial engineering students. 

4070 Production Systems Planning and Control II (3)
Theory and application of master scheduling, materials requirements planning systems, lot sizing and safety stocks, distribution requirements planning. Prereq: 4060.

4080 Forecasting Methods in Industrial Engineering (3)
Application of technological forecasting techniques to industrial engineering problems. Includes moving averages and exponential smoothing, linear and polynomial regression models, autocorrelated time-series analysis, Delphi methods and other selected industrial forecasting methods. Prereq: 4060.

4150 Project Control with CPM and PERT (3)
A study of project planning and control based primarily on the use of CPM and PERT. Prereq: Engineering Science and Mechanics 3310. Not available for graduate credit for industrial engineering students.

4170 Automatic Process Control (3)
Characteristics of automatic processes and controllers: elementary open and closed loop analysis, and applications to industrial control system. Prereq: Mathematics 2860 and Engineering Science and Mechanics 2720.

4200 Production Facilities Design (4)
Materials handling, plant layout, service areas, inventory control applications, and operating procedures design. Prereq: 3630, 3510-20, 4060, 4520.

4230 Scheduling Systems (3)
Performance measurements, job shop and flow shop scheduling, including both static and dynamic conditions, as well as techniques for generating production schedules. Deterministic and probabilistic dispatching conditions. Prereq: 3520.

4250 Work Measurement Applications (3)
Application of learning curves, queuing theory, standard data methods and incentive systems to the design of industrial work situations.

4520 Engineering Economy (3)
Methods and problems in selection or replacement of equipment. Decisions among engineering alternatives, involving capital recovery, economic life of equipment, and rate of return on investment. Not available for graduate credit for industrial engineering students.

4530 Case Studies in Engineering Economy (3)
Extension of basic engineering economy principles to practical problems faced by competitive firms and regulated industries. Case studies taken from literature form basis of classroom discussion. Out-of-class assignment is made which involves working with local companies to evaluate make or buy options, leasing versus cash purchases, equipment placement studies, energy source economies. Prereq: 4520.

4540 Industrial Development (3)
Factors other than mechanical or chemical which enter into successful plant development and manufacturing enterprises. Cost and location studies and market analysis to determine the commercial feasibility of new plants or plants.

4590 Simulation (3)

4600 Predetermined Time Systems (3)
Work design and measurement using predetermined time system; methods time measurement, basic motion time study, work factor. Theory and application. Prereq: 3830.

4610 Human Factors in Work Design II (3)
Human capabilities and limitations affecting work place layout, working environments, design of tools and equipment, and communications and response in human-machine systems. Prereq: 3660, 3630, or consent of instructor.

4830 Health Systems Engineering (3)
Hospital management systems and means by which they may be improved through application of modern industrial engineering principles and techniques.

4860 Industrial Systems Analysis (3)

4870 Mini-Computer Applications in Industrial Engineering (3)
Introduction to computer hardware and human-computer interfaces; emphasis on small computers as element of larger system; applications and limitations of computers in solving industrial engineering problems. Prereq: Senior standing.

5190-20-30 Special Industrial Engineering Topics (3, 3, 3)
Prerequisite: Consent of instructor. May be repeated.

5160 Materials Handling (3)
Analysis and planning for the overall problem of moving, packaging, and storing of materials; equipment comparison and selection; cost analysis. Prereq: 4520 and Engineering Science and Mechanics 3310. Not available for graduate credit for industrial engineering students.

5240 Facilities Planning and Design (3)
Modern facilities management and design, including telecommunications, industrial control systems. Modes analysis with Laplace and Z-transforms. Compensation technique for linear systems. Prereq: Consent of instructor.

5340 Applied Decision Theory (3)

5360 Statistical Methods in Industrial Engineering (3)
Survey of operations research techniques and interpretation of data collected in application of industrial engineering techniques. Prereq or consent of instructor.

5420 Reliability Engineering (3)

5520 Advanced Engineering Economy (3)

5560 Human Factors Engineering (3)
Human characteristics which influence design of tools, equipment, environments, and products. Modeling of human operators, computer system and human-computer interfaces. Prereq consent of instructor.

5610 Human Factors Engineering (3)
Human operator, performance characteristics, and environmental requirements. Formal description of human operator's transfer characteristics through qualitative models and models describing operator as information processor. Prereq: 5600.

5700 Optimization Methods in Industrial Engineering (3)
Survey of operations research techniques with emphasis on application to industrial engineering problems. Prereq: Mathematics 2860 (or equivalent), Statistics 3450, computer programming. Available for credit only to students without a B.S. degree in industrial engineering.

5710 Linear, Quadratic and Sepa rable Programming (3)

5710 Linear, Quadratic and Separable Programming (3)

5720 Queuing Models and Simulation (3)
Theory and application of queuing models and simulation methods employed to evaluate complex queuing systems. Data analysis and hypothesis testing related to pertinent waiting line probability density functions. Prereq: 5700, 5560.

5730 Game Theory and Random Processes (3)
Operations research including game theory with applications to decision making in competitive environment, and random processes with applications to queuing, inventory models and decision making. Prereq: 4560.

5810 Theory of Industrial Automatic Control (3)

5830 Health Systems Engineering II (3)
Health systems for analysis, control, and improvement of performance and total health care delivery. Prereq 4830 and 5560.

5840 Air Traffic Control Systems (3)
Current systems of air traffic control. Stochastic systems and air traffic control. Design and use of applicable system
models. Prereq: Statistics 3450, Computer Science 3150.


5900 Design Project (1-9) Industrial engineering topics. May be repeated. Maximum 9 hrs.

5910-20-30 Special Topics in Industrial Engineering (3, 3, 3) Special problems for students qualified to do individual or group research projects. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


6520 Operations Research Models in Engineering Economy Decisions (3) Traditional capital planning and budgeting techniques; operations research approaches to capital budgeting problems. Mathematical programming and computer simulation. Interrelated projects, uncertain cash flows, and choice of appropriate evaluation criteria. Prereq: 5520, 5710.

6700 Nonlinear Programming (3) Optimization techniques for static and dynamic nonlinear systems subject to equality and inequality constraints. Applying optimization theory to solve nonlinear optimization problems. Variable metric methods, search methods, constrained nonlinear programming, and penalty function methods. Prereq: 5700.


6810 Advanced Topics in Industrial Engineering (3) Will cover topics not covered in other graduate courses. A forum for advanced graduate students to study individually or in group as appropriate. Prereq: Graduate standing or permission of instructor. May be repeated with consent of department.

### Mechanical and Aerospace Engineering

#### MAJORS

- Aerospace Engineering
- Mechanical Engineering

#### DEGREES

- M.E., M.S., Ph.D.
- M.E., M.S., Ph.D.

#### Professors:

- M. W. Milligan (Head), Ph.D., Tennessee, P.E.;
- C. T. Bailey, Ph.D., Peoria, P.E.;
- M. D. Edmondson, Ph.D., Texas A & M, P.E.;
- W. F. Wolfe, Ph.D., California Institute of Technology, J. W. Godson, Ph.D., Georgia Institute of Technology, P.E.;
- R. H. Hoyle, Ph.D., P.E.;
- W. S. Johnson, Ph.D., Clemson, P.E.;
- E. B. St. John, Ph.D., University of Wisconsin State;
- M. Kurokaz, Ph.D., California Institute of Technology, R. L. Maxwell, M.S. Case Western Reserve, R. E. H. Reitz, Ph.D., Southern Methodist, P.E.;
- F. Shahkoh, Ph.D., Oklahoma;
- H. Speckhart, Ph.D., Georgia Institute of Technology, P.E.;
- J. W. Wu, Ph.D., California Institute of Technology, Y. L. Young, Ph.D., Northwestern, P.E.

#### Associate Professors:

- S. E. Becker, Ph.D., North Carolina State, P.E.;
- C. W. Brown, M.S., Tennessee, P.E.;
- N. Chauvet, Ph.D., Indian Institute;
- F. G. Collins*, Ph.D., California (Berkeley);
- J. A. Euler, Ph.D., Purdue, P.E.;
- R. K. Krane, Ph.D., Oklahoma;
- J. A. Lang, Ph.D., Pennsylvania State, T. T. Moulden', Ph.D., Tennessee;
- G. V. Smith, Ph.D., Pennsylvania State, Ph.D., North Carolina State.

#### Assistant Professors:

- R. Armanii, Ph.D., Virginia Polytechnic Institute;
- P. E. George, Ph.D., Purdue, J. Masimer, Ph.D., P.E.;
- R. G. Parsons, Ph.D., North Carolina State.

#### GRADUATE STUDY PROGRAMS

Graduate programs in Mechanical Engineering or Aerospace Engineering are available which lead to the degrees of Master of Engineering, Master of Science, and Doctor of Philosophy with concentrations in solar energy, energy conversion and utilization, power generation, machine design and dynamics, aerodynamics and gasdynamics, aeroacoustics, stress analysis, propulsion, heat transfer and fluid mechanics, and thermodynamics. In addition to the general policies and requirements of The Graduate School, each student's program must be approved by the student's committee. Specific program requirements are given below.

#### MASTER OF ENGINEERING PROGRAMS

Entrance into the Master of Engineering program is restricted to qualified graduates of A.B.E.T.-accredited undergraduate curricula in mechanical or aerospace 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. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

#### MASTER OF SCIENCE PROGRAMS

Entrance into the Master of Science programs 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 (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

#### MASTER'S PROGRAM OPTIONS

Three program options are available:

- **A. The Thesis Option.** The requirements of this option are that the student must satisfactorily complete a program of study that includes:
  1. A minimum of 36 quarter hours of coursework which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.
  2. A minimum of 9 quarter hours of credit in thesis.

- **B. The Course Option.** Normally, this program is restricted to those students who have had significant engineering work experience. The evaluation of the work experience and the final selection of the student's program of study are left to the student's committee. The requirements of this option are that the student must satisfactorily complete a program of study that includes:
  1. A minimum of 45 quarter hours of course work which includes at least 27 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics. No more than 3 quarter hours of engineering course work may be below the 5000 level.

- **C. The Problems Option.** The requirements of this option are that the student must satisfactorily complete a program of study that includes:
  1. A minimum of 36 quarter hours of course work which includes at least 18 quarter hours of graduate (5000-level or above) courses in mechanical and/or aerospace engineering and normally 9 quarter hours of course work (4000-level or above) in mathematics.
  2. A minimum of 9 quarter hours credit in Selected Engineering Problems (5900). A written report must be presented for each problem investigated.

#### PhD PROGRAMS

- **D. The Thesis Option.** The requirements of this option are that the student must satisfactorily complete a program of study that includes:
  1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.
  2. A minimum of 36 quarter hours of credit in doctoral dissertation.
  3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.
  4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis, problems, or dissertation credit.

- **E. The Course Option.** The requirements of this option are that the student must satisfactorily complete an approved program of study which normally includes:
  1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.
  2. A minimum of 36 quarter hours of credit in doctoral dissertation.
  3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.
  4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis, problems, or dissertation credit.

- **F. The Problems Option.** The requirements of this option are that the student must satisfactorily complete an approved program of study which normally includes:
  1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.
  2. A minimum of 36 quarter hours of credit in doctoral dissertation.
  3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.

- **G. The Course Option.** The requirements of this option are that the student must satisfactorily complete an approved program of study which normally includes:
  1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or problems.
  2. A minimum of 36 quarter hours of credit in doctoral dissertation.
  3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.
  4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis, problems, or dissertation credit.
  5. Participation in the departmental seminar program.

### GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Junior (3000-level) and senior (4000-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 4000-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

Mechanical Engineering

3000 Energy—An Overview (4) Introduction to available energy resources, recovery and utilization; power generation techniques including conservation schemes; emphasis on the resources-environment-human interaction associated with energy; primarily for non-engineering students.

3110 Applied Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties; applications to engineering problems.

3311 Engineering Thermodynamics (3) Energy and laws governing energy transformations; thermodynamic properties.

3350 Engineering Thermodynamics (3) Properties of gases and liquids, heat transfer, chemical reactions, equilibrium; applications to mechanical engineering problems.

3410 Fluid Flow (3) Development of continuity, momentum and energy principles for fluid systems; applications of mechanical and aerospace engineering problems.

3440 Heat Transfer (3) Heat transfer processes; heat-conduction, thermal radiation.

3520-30-40 Thermal Sciences (2, 3, 3) Fundamental principles of thermodynamics and transport phenomena as applied to engineering design. To be taken in sequence.

3610 Mechanics of Machinery—Kinematics (3) Machine motions, graphical and analytical methods; instantaneous centers; velocities; accelerations.

3620 Mechanics of Machinery—Dynamics (3) Applications of Newton's laws, work, energy, and impact to machinery. Force analysis of mechanisms, balancing, gyroscopic effects, flywheels. Prereq: 3610.

3630 Mechanics of Machinery—Vibrations (3) Free and forced vibrations of single and multiple degree systems. Balancing of machinery.

3650 Introduction to Machine Design (3) Ductile-behavior of materials under static and cyclic loading. Stress concentration, design factors and theories of failure. Changes in material behavior in processing and fabrication. 2 hrs and 1-2 hr lab.

3910 Engineering Analysis (3) Advanced analysis techniques for problems of aerospace and mechanical engineering. Emphasis on approximate methods.

4100 Energy Conversion Systems (3) Operating and design characteristics including new technology development; selected direct conversion techniques.

4150 Energy Conversion Systems (3) Fossil fuel systems with emphasis on coal technology.

4160 Design of Energy Conversion Systems (3) Synthesis and design of system including economic and technical aspects. Participation in team design effort including formal presentations and design report.

4170 Turbo-Machinery (3) Basic principles of turbomachinery; systematic methods or analysis, design, engineering major application.

4180 Energy Production and Utilization (3) Thermodynamics constraints on energy production; comparison of power generation methods; evaluation of new energy sources and concepts; energy conservation schemes.

4220 Environmental Noise (3) Basic principles of acoustics including sources of noise in industrial and community environments.

4420 Heat Transfer (3) Heat transfer by free and forced convection, heat transfer with phase changes, heat exchanger applications.

4450 Lubrication (3) Hydrodynamic theory of lubrication; significance of boundary, application of Navier-Stokes equations to infinite and finite bearings; analytical and numerical solutions; applications to design.

4471-91 Experimental Mechanical Engineering (3, 3) Experimental methods and measurements of force, length, time, temperature, pressure, transport rates, and physical properties. Planning, conducting, analyzing, and reporting experimental tests run according to test standards and other specifications.

4510 System Dynamics (4) Analytical models of physical systems, linearization, Laplace transforms, tolerance characteristics and stability of systems, numerical simulations, and analog computer solutions. Not for departmental graduate credit.

4520-30 Creative Design (3, 3) Application of engineering principles to the solution of current problems with emphasis on design innovation.

4621 Manufacturing Processes (3) Comparison of manufacturing methods; plastic production; metrology.

4622 Tool Design (3) Principles underlying tool and die design, design of high-volume production tools and molds, work holding fixtures.

4623 Numerical Control Processing (3) Application of numerical control technology and computer utilization. Automatic tool changing and transfer machines.

4624 Manufacturing Engineering Systems Design (3) Design of complete manufacturing system for a particular product: manufacturing planning, tool and fixture design, selection of manufacturing operations, redesign of product to reduce cost.

4625 Manufacturing Process Engineering (3) Selection of materials in design process, emphasis on mechanical and production factors, theories of failure to design machine elements, springs and clutches; election of chains and belting.

4631 Energy Methods in Mechanical Design (3) Application of energy principles in complex beams and structures.

4660 Materials and Manufacturing Process (3) Selection of materials in design process, emphasizing relationship of material properties, environment, temperature, manufacturing technology and cost.

4670 Machine Elements (3) Application of strength and properties of materials, design factors, theories of failure to design machine elements, springs and clutches, selection of sleeve and rolling element bearings.

4680 Machine Elements (3) Application of strength and properties of materials, design factors, theories of failure to design cam sags, gatings, brakes and clutches; election of chains and belting.

4690 Machine Design (3) Innovative design of complete machine. Emphasis on specifications, design calculations, working drawings and cost analysis. Written and oral report.

4710 Thermal Environmental Systems (3) Vapor compression and absorption cycles; heat pump systems; moist air properties; psychrometric processes.

4720 Thermal Environmental Systems (3) Design analysis of air washers, cooling towers and extended surface coils; solar radiation; building heat transmission; physiological effects.

4730 Thermal Environmental Systems (3) Design of heating ventilation and air conditioning systems.
Aerospace Engineering

3610 Dynamics (3) Newton's Law: work-energy impulse-momentum, Lagrange equations, central force, gyroscopic effects. Applications to aerospace systems.

3620 Mechanical Vibrations (3) Free and forced vibrations of single and multiple degree vibrating systems, balancing of rotating machinery.

3630-40 Structural Analysis of Aerospace Vehicles (3, 3) Fundamentals of structural analysis as applied to configurations of aerospace interest. Introduction to aeroelasticity phenomena. Must be taken in sequence.

4110 Aerodynamic Fundamentals (3) Atmosphere, complete aerodynamic phenomena including perfect, ideal gases, fluid flow types, airfoil theory, wing theory, drag. For non-aerospace engineering majors only.

4120 Aircraft Propulsion and Performance (3) Propellers, propulsion systems for aircraft, static performance and special performance problems, maneuvers, control surfaces, stability and control. For non-aerospace engineering majors only.

4210 Compressible Flow (3) One-dimensional incompressible flow and expansion waves; friction and nonideal adiabatic flow.

4220 Low Speed Aerodynamics (3) Potential flow theory; kinematics and dynamics of perfect fluids; analysis and design of aerodynamic bodies.

4230 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods.

4240 Astronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems.

4250 Propulsion (3) Principles of propulsion devices; turbojet, ram-jet, and rocket engines.

4260 System Design (3) Synthesis and design of complete aerospace systems including aerodynamic and technical aspects. Participation in team design effort including formal presentations and design report.

4471-91 Experimental Aerospace Engineering (3, 3) Experimental methods and measurements of force, length, time, temperature, pressure, transport rates and physical properties. Planning, conducting, analyzing, and reporting experimental tests according to test standards and other specifications.

4510 Airplane Performance (3) Introduction to airfoil and wing characteristics, drag; propellers; static performance and maneuvers; theory and design of control surfaces. For non-aerospace engineering majors only.

4910 Selected Topics in Aerospace Science (3) Current problems in aerospace science; topics in science and engineering required for an understanding of the several areas of aerospace science.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) E Required for the non-thesis student not otherwise registered during any quarter when such a 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.

5100 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; conformal mapping; hodographs. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.

5120 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments, including equations of motion, multibody problems, fluid mechanics, gas dynamics, stability and control of rotary wing, tilt wing, vectored lift engines. Space environment. Theoretical and practical aspects. Prereq: 4220 or Mechanical Engineering 5310 or equivalent.

6810 Advanced Boundary Layer Theory (3) Development and presentation of boundary layer concepts in nonhomogeneous moving medium, sound waves due to turbulence, vortical sound, pseudosound, propagation and absorption of sound in ducts, instrumentation and measuring techniques. Prereq: Consent of instructor.

5620 Aeroacoustics I (3) Special topics and recent research in aeroacoustics: Turbulence, microphone noise, jet noise, and general theoretical developments, empirical equations. Prereq: 5610.

5810 Aviation Systems: An Overview (3) Aviation systems, present and future, emphasis on systems approach. Socioeconomic basis for aeronautical and propulsion technology, meteorology, air traffic control, airport-community interface, and technological trends and developments pertinent to present and future development of air transportation. For non-aerospace and non-mechanical engineering majors only. Prereq: 5810.

5820 Air Vehicles (3) Current capabilities and future requirements for air transport vehicles. Parameters significant for air vehicle type selection. Integration of air vehicle into aviation system. For non-aerospace and non-mechanical engineering majors only. Prereq: 5810.

5900 Selected Engineering Problems (3-9) Selected problems in aerospace engineering to fulfill requirements of Problems Program. Enrollment limited to students in Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) All phases of aerospace engineering, related innovations and reports on current research. The University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Aerospace Engineering Credit to be arranged; 3 hrs maximum each quarter.

6000 Doctoral Research and Dissertation (3-15) E


6320 Magnetohydrodynamics II (3) Continuum magnetohydrodynamic equations. Alfven and shock waves, exact solutions for magnetohydrodynamic channel flows, one-dimensional model of channel flow, magnetohydrodynamic boundary layer. Prereq: 6310, Mathematics 5620.

6330 Magnetohydrodynamics III (3) Engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 6320, Mathematics 5630.

6410 Physical Gasdynamics (3) High-speed, high temperature flow of gas from molecular point of view; molecular concepts and simple kinetic theory; equilibrium properties of gases and gas mixtures from steady-state kinetic theory chemical thermodynamics, and statistical mechanics. Prereq: 5220 and Mechanical Engineering 5220.

6420 Physical Gasdynamics (3) Continuation of 6410; flows of gas mixtures in local thermodynamic and chemical equilibrium; physical and chemical basis of rate equations; flow with vibrational and chemical nonequilibrium. Prereq: 6410.

6510-20-30 Advanced Aerodynamics (3, 3, 3) Subsonic, transonic, supersonic, and hypersonic flows treated with unified and unified manner with combined viscous/inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations and consequences. Foundations of gas dynamics with emphasis on applications to airplane, rocket, ground test facilities, jet engine. Discussion of special topics according to students' interest. Prereq: 5110, 5220, and 5240 or equivalent.

6810 Advanced Boundary Layer Theory (3) Derivation and critical review of governing equations. Approximate methods; similarity solutions; methods; boundary layer transformations. Approximate integral methods to include compressibility and heat transfer. Attached and separated flows; shock-wave-boundary layer interaction. Prereq: 5220, Mechanical Engineering 5120, and Physics 5630.

6910 Advanced Topics in Gasdynamics (3) Selection of topics based on particular interests of students. Nonequilibrium gasdynamics, nonequilibrium gasdynamic flows, advanced kinetic theory, perturbation techniques. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

**Nuclear Engineering**

**MAJOR**

**DEGREES**

M.S., M.E., Ph.D.

**Professors:**

P. F. Pasqua (Head), Ph.D. Northwestern, P.E.;
H. L. Dodds, Ph.D. Tennessee, P.E.; J. B. Furse, Ph.D. Georgia Institute of Technology; T. W. Kerlin, Ph.D. Tennessee; J. F. Mott, Ph.D. Minnesota; R. Perez, Ph.D. Madrid (Spain); J. C. Robinson, Ph.D. Tennessee; H. C. Roland, Ph.D. Tennessee; P. N. Stevens, Ph.D. Northwestern, P.E.

**Associate Professor:**

L. Miller, Ph.D. Texas A & M, P.E.

**Assistant Professors:**

E. M. Katz, Ph.D. Tennessee; B. Upadhyaya, Ph.D. University of California.

The Department of Nuclear Engineering offers degrees in Master of Science, Master of Engineering, and Doctor of Philosophy with concentrations in nuclear dynamics, nuclear reliability and risk, radiation transport, thermal hydraulics, and core analysis.

**MASTER OF SCIENCE PROGRAM**

A graduate program leading to a degree of Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the necessary prerequisite courses before he/she enters the program. The student must complete a program of study approved by the student's advisory committee and which includes the following:

1. A major consisting of a minimum of 18 quarter hours of graduate courses in nuclear engineering.
2. A minor of 9 quarter hours in mathematics, statistics or computer science.
4. Final examination covering the thesis and graduate coursework.

An alternate program is available for the Master of Science degree which involves engineering practice rather than a thesis. The student must complete a program of study which includes the following:

1. Thirty-six quarter hours of course work similar to the requirements for the regular Master of Science program (see above).
2. Twenty-four quarter hours of Nuclear Engineering 5980. A student usually registers for 6 hours of Nuclear Engineering 5980 each quarter and investigates problems assigned by a member of the faculty. At the end of each quarter the student submits a written report and makes an oral presentation of the work. The student must complete a program of study which includes the following:

**MASTER OF ENGINEERING PROGRAM**

A graduate program in Nuclear Engineering leading to the degree of Master of Engineering is available to those graduates with an accredited engineering degree or one which satisfies A.B.E.T. basic level criteria. In addition to Graduate School requirements the following degree requirements must be met:

1. Thirty-six quarter hours of course work, 18 of which must be in graduate nuclear engineering.
2. A minimum of 9 hours of design project, thesis, or 24 hours of Nuclear Engineering Practice (5980). Documentary proof of significant engineering experience may be submitted in lieu of the design project, thesis or Nuclear Engineering Practice, but in this case 45 hours of course work are required.
3. Nine hours of course work submitted must be from Nuclear Engineering.
4. 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 sciences, basic sciences, or engineering.
5. A candidate must pass a final oral examination on all work presented for the degree.

**THE DOCTORAL PROGRAM**

Students in the field of nuclear engineering desiring to study for the degree of 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 field 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. degree in Nuclear Engineering include:

1. A minimum of 72 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis or Nuclear Engineering Practice.
2. A minimum of 36 quarter hours of credit in doctoral research.
3. A minimum of 45 quarter hours in nuclear engineering courses numbered 5000 and above (or the equivalent), with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis or dissertation credit.
4. A minimum of 18 quarter hours in mathematics, computer science, or statistics in courses beyond nuclear engineering undergraduate requirements. Must be numbered 4000 or above.
5. A minimum of 9 quarter hours in courses numbered 5000 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 will be determined by the student's doctoral committee.

**4110-20-30 Introduction to Nuclear Reactor Theory (3, 3, 3) Nuclear structure, radioactive decay law, basic neutron interaction; fission process, chain-reacting systems; diffusion equation including multigroup diffusion theory, neutron moderation; reactivity coefficients; perturbation theory. Prereq: Physics 3730 or consent of instructor. F, W, Sp**

**4140 Thermonuclear Systems (3) Fusion reactions; properties of plasmas; plasma containment; plasma and material interaction; transport devices. Prereq: Physics 3730, Mathematics 4550. F**
4210-20-30 Nuclear Engineering Laboratory (3, 3, 3) Radiation detection and counting instrumentation, monitoring statistics, half-life and decay schemes, gamma spectrometry, cross-section measurements, analog computation, diffusion properties of neutrons, critical control, experimental control rod calibration, statistical weight, shielding, xenon poisoning, prompt critical reactor behavior, fission density and adiabatic flux. Prereq or coreq: 4110 or equivalent. F, W, Sp


4710 Energy Transport (4) Development of differential and integral energy conservation equations; conduction, convection, and radiation heat transfer; applications to nuclear reactor fuel elements and fuel exchangers. Prereq: 3730. F

4720 Reactor Thermal Design (4) Hydrodynamics and heat transfer in boiling systems; boiling crises; fuel element thermal design, steam generator design. Prereq: 4710. W

4730 Nuclear Reactor Design (3) First order reactor design, integration with non-nuclear heat transfer and power conversion system, economic evaluation; optimization procedures, description of typical systems. Coreq: 4130. Sp

4810 Radiation Shielding (3) Types of radiation sources, gamma ray and neutron attenuation, biological effects of radiation shielding. Prereq: Physics 3730, Mathematics 4550. Sp

4820 Reactor Kinetics and Controls (3) Derivation of kinetic equations; basic kinetic parameters; transient response and feedback; control and protective systems. Prereq: 4110. W

4840 Nuclear Reactor Safety (3) Presentation of reactor safety concepts and criteria; credible accidents; fission product release and transport; containment systems; accident analysis; engineered safeguards. Prereq: 4120. F

4930 Nuclear Fuel Management (3) Discussion of problems associated with processing of nuclear materials; fuel cycle analysis; burnup calculation. Prereq: 4120. W

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree requirements are completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5110-20-30 Transport Processes in Nuclear Engineering (3, 3, 3) Momentum and heat transport; development of conservation equations; elementary theory of turbulence; heat transfer and flow through conduits; conduction; radiation; reactor core thermal analysis. Prereq: 4720 or equivalent, Mathematics 4710, 4550. F, W; Sp

5210 System Dynamics (3) Transient analysis, Laplace transforms, transient response, stability (linear and non-linear), and sensitivity analysis by state variable methods. Dynamic analysis of distributed systems. Prereq: Consent of instructor. F

5220 Reactor System Dynamics (3) Application of methods of general system dynamics to reactor systems; eigenvalues, control systems, control rod calibration. Dynamics, stability, and control of zero power reactors and power reactor systems. Prereq: 5210, 4130 or equivalent. W


5240 Reactor Instrumentation (3) Instrument components and systems for operation, control, and safety of nuclear reactors; role of instrumentation in public health and safety; engineered safeguards for nuclear power plants. Prereq: 4820, or consent of instructor. A

5310-20-30 Nuclear Systems Reliability (3, 3, 3) Systems reliability analysis as applied to nuclear systems. Qualitative and quantitative methods. Coreq: Statistics 3450. F, W; Sp

5410 Nuclear Fuel Cycle Analysis (3) Alternative fuel cycles, symbiotic reactor systems and appropriate reactor systems: resource utilization, potential growth rules and system design considerations. Impact of selecting alternative systems from technical and economical viewpoints. Prereq: 4130 or equivalent.

5420 Reprocessing and Waste Disposal (3) Basic processes related to solvent extraction of nuclear fuel isotopes. Reprocessing of light water reactor and advanced reactor fuels. Disposition of radionuclides: reprocessing, site selection and environmental effects. Prereq: 4130 or equivalent.

5510-20-30 Nuclear Systems (3, 3, 3) Various reactor types; flow diagrams, thermodynamic analysis, control methods, component descriptions of power systems using various reactor types and nuclear power economics. Prereq: 4610-20-30 or equivalent or consent of instructor.

5710-20-30 Nuclear Design (3, 3, 3) Analytical techniques for neutronic aspect of nuclear reactor core design. Multigroup discrete ordinate theory, multigroup PN theory, integral transport theory, perturbation theory, and others. Generation of required multigroup constants formulated with available point data and Nordheim treatment in slowing down region and gas kernel in thermal region. Prereq: 4130 or equivalent. F; W; Sp

5740 Reactor Shielding (3) Application of analytic solutions of Boltzman transport equation to shield design problems. Spherical harmonics, moments methods, numerical solutions, adjoint calculations, and invariant imbedding cases studied. Prereq: 4810. F


5840-50 Fast Breeder Reactors (3, 3) Special characteristics of fast breeder reactors; emphasis on LMFBR. Need for breeders; neutron physics and thermal characteristics of reactor core; development status of engineering components; fuel cycle cost analysis; safety; coolants other than sodium; world status of development.

5970 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department.

5980 Nuclear Engineering Practice (3-12) Experiences in solving and reporting on engineering problems. Prereq: Approval of Nuclear Engineering Department. May be repeated. Only Alternate Plan students may take this course. S/NC only. E

6000 Doctoral Research and Dissertation (3-15) E

6110-20-30 Selected Topics in Reactor Theory (3, 3, 3) Transport theory, control rod theory, and perturbation theory. Selected topics from literature. Prereq: Consent of instructor. F, W, Sp

6140 Radiation Shielding (3) Advanced topics in radiation shielding. Monte Carlo techniques and space radiation problems. Natural space radiators, energy-source radiators, dose conversion, probability, selected neutron, gamma, and space-radiation shielding problems. Prereq: Consent of instructor. Sp

6150 Reactor Dynamics (3) Special topics in reactor dynamics and control. Prereq: Mathematics 5630. Sp

6410 Selected Topics in Nuclear Systems Reliability Engineering (3) Advanced state-of-the-art topics in nuclear systems reliability engineering and risk assessment. Prereq: 5330 or consent of instructor.

6510 Nuclear Reactor Noise Analysis (3) Modern system theoretical methods for evaluating reactor performance descriptors from operating data. Prereq: 4610 and Electrical Engineering 5740 or equivalent.

6710 Two-Phase Flow and Heat Transfer (3) Pool boiling and flow boiling; hydrodynamics of two-phase flow, boiling crises, two-phase instabilities. Prereq: 5130 or equivalent. Su
College of Home Economics

Nancy Belk, Dean
Jay Stauss, Associate Dean, Graduate Studies and Research
Fran Andrews, Assistant Dean, Undergraduate Studies
Helen Grove, Assistant to the Dean

Graduate studies in Home Economics prepares the student for teaching, research and public service in colleges and universities or managerial positions in government and industry.

General requirements for graduate study are prescribed by The Graduate School and the student's department. Each student's application is reviewed by faculty, and students lacking adequate preparation may be required to take additional courses as prerequisites to graduate study.

APPLICATION FOR ADMISSION AND FINANCIAL AID

Requirements for admission to The Graduate School are on page 10 of this catalog. A College of Home Economics application and three Graduate School Rating Forms are required. These may be obtained at the Dean's Office, Jessie Harris Building, or write/call: Jay Stauss, Associate Dean for Graduate Studies and Research College of Home Economics The University of Tennessee Knoxville, Tennessee 37916 Phone: (615) 974-5221

Graduate Record Examination scores for the aptitude test including the quantitative, verbal, and analytical sections are required for the graduate record examination.

ACADEMIC COMMON MARKET

The ACM is an interstate agreement among southern states for sharing academic programs. Through this agreement students from participating states are eligible for in-state tuition. Potential students enrolled in the Academic Common Market are eligible to participate in the Academic Common Market.

Those who plan to enter a Master's program in Food Systems Administration require the aptitude test including the quantitative, verbal, and analytical sections.

The Master's program in Nutrition and Dietetics requires the aptitude test including the quantitative, verbal, and analytical sections.

the student's major area(s) and elective area(s) are prescribed by The Graduate School and are advised by the student's department.

A minimum of 30 hours at or above the 5000-level is required.

In some instances two related minor areas may be selected with 9 hours in each area.

Minor area(s) of study is required in the program. Some majors require 9 hours in one minor area.

CONSUMER STUDIES AND HOUSING:

PUBLIC POLICY

The Doctoral Program in Consumer Studies and Housing: Public Policy is offered through the Departments of Child and Family Studies (CFS) and Textiles, Merchandising and Design (TMD). Students choose either consumer studies (CFS) or housing (TMD) as the base area. A minor area comprising 12 credit hours is required; these hours are to comprise a related sequence of courses which support the student's program and may be drawn from any unit within the University.

A minimum of 9 hours must be taken outside the base area. A minimum of 27 credit hours within the College. A minimum of 30 hours at the 5000-6000 level is required. Students may also take a 3-hour course in research methods or statistics. The thesis option requires 24 credit hours in the base area, including 9 hours of Thesis. The non-thesis option requires 21 credit hours in the base area, including 6 hours of practicum.

DOCTORAL PROGRAM

The doctoral program in Home Economics provides three options of study: interdisciplinary, food science, and nutrition. The interdisciplinary option is available in all departments in the College. The doctoral program requires:

1. A minimum of 96 quarter hours in courses beyond the Bachelor's degree exclusive of credit hours for the Master's degree.

2. Selection of an option and fulfillment of the requirements as directed by the major professor and approved committee.

3. The faculty committee for each doctoral student shall determine whether a reading knowledge of a foreign language is required.

4. Written comprehensive examination.

5. Doctoral research and dissertation (minimum 36 hours; maximum 48 hours) may be included in the 96 hours presented for the degree.

field with 18 hours at the 5000 and 6000-level. A minimum of 30 hours of 5000 and 6000-level courses is required in the program. Some majors may require 9 hours in one minor area.
6. Final examination. 

Other Requirements: 

Interdisciplinary option: The interdisciplinary option of the Doctor of Philosophy degree in Home Economics provides an opportunity for advanced graduate study with an interdisciplinary approach that focuses on the development, integration and application of knowledge to innovative solutions of the multi-level problems of society. As suggested by the program, a student in the interdisciplinary doctoral program is in the relatively unique position of having a number of alternatives available— alternatives which are developed as a function of the student's creation within the general framework provided. 

Individual and Family Behavior (base department of Child and Family Studies): 
- normal developmental processes in individuals and families; 
- socialization through childhood, adolescence, and adulthood; 
- behavior in diverse environmental and cultural settings; 
- interaction processes within families; 
- community services and planning to meet development needs of individuals and families. 

Physiological Development and Well-being (base department of Nutrition and Food Sciences): 
- physiological response to nutrient intake 
- improvement of nutritional status through informed consumer nutrition options. 
- cultural, economic, and technological influences on food selection. 

Environmental Factors (base department of Textiles, Merchandising, and Design; or Nutrition and Food Sciences): 
- the relationship between family structure and decision-making processes in the use of human resources; 
- the effects of social macro- and microeconomics and political development on consumption patterns and other behavior; 
- communication programs to meet the socioeconomic needs of consumers. 

1. Home Economics 610-20, 6210. 
2. Twenty-four to 36 hours from at least two areas in the College of Home Economics. 
3. Fifteen to 24 hours in collateral or supporting courses (mainly from departments in other colleges in the University) including courses to give sufficient competence in statistics and research methods needed for dissertation research. 
4. Doctoral research and dissertation based on a problem within the interdisciplinary concentration. 

Food Science option and food science with concentration in food systems administration: 
1. Three hours in research methods from Food Science 5510 or 5520 or Food Systems Administration 5210; 6 hours from Food Science 5810-20-30-40, 6110, Food Systems Administration 6110; and Zoology 5350 or equivalent. 
2. Twenty-four hours in 5000- and 6000-level courses in food science or in food systems administration. 
3. Nine hours in a collateral area. Upon approval of student's faculty committee, 4000, 5000, and 6000 courses in collateral area may be substituted for 5000 and 6000 courses in food science or in food systems administration. 
4. Minimum of 4 hours of credit in doctoral seminar. 

Interdisciplinary option: 
1. Thirty hours of 5000 or 6000 courses in nutrition exclusive of research and Zoology 5350 or equivalent. 
2. Nine hours in a collateral area. Upon approval of student's faculty committee, 4000, 5000, and 6000 courses in collateral area beyond the 9 hours may be substituted for 5000 and 6000 courses in nutrition. 
3. Minimum of 4 hours of credit in doctoral seminar. 

GRADUATE PROGRAMS FOR HOME ECONOMICS EXTENSION 

Graduate programs at both the doctoral and Master's levels are available for students interested in home economics extension. At the doctoral degree level, programs of study may be planned in the interdisciplinary or in the food science options. A Master's degree major in Consumer Studies and Housing: Public Policy is particularly suitable for students interested in home economics extension, although Master's programs may be planned in any subject matter area of home economics with agricultural extension education as a collateral area. Additionally, four-week courses are offered in February each year for students particularly interested in home economics extension.

Departments of Instruction

Child and Family Studies

MAJORS

Child and Family Studies M.S. 
Consumer Studies and Housing/Public Policy M.S. 
Home Economics Ph.D.

Professors: 
P. L. Highberger, Ph.D. Iowa; N. Belick (Dean), Ph.D. Michigan State.

Associate Professors: 
J. J. Cunningham, Ph.D. Michigan State; D. B. Eastwood, Ph.D. Tufts; V. M. Nordquist, Ph.D. Tennessee; J. Staats (Associate Dean), Ph.D. Washington State; R. M. Swagler, Ph.D. Ohio State; S. Twardosz, Ph.D. Kansas; P. White (Head), Ed.D. Tennessee.

Assistant Professors: 

4220 Conserving Time and Energy in the Home (3) Application of management principles to home-making activities; evaluation of equipment, work centers and work procedures in terms of time and energy demands. Adaptations for the handicapped.

4250 Adult Development and Aging (3) Adult life in our society. Adjustment to internal and environmental changes through middle and aged years. Prereq: 2110 or Home Economics 1510 or equivalent background in adult development or consent of instructor.

4350 Advanced Child Development (3) Survey of selected theories relevant to child development with emphasis on research literature and research methodology. Prereq: 4 hrs. psychology and 6 hrs child development or equivalent. W

4420 Learning Experiences with Parents (3) Dynamics of parent-teacher interaction. Emphasis on a variety of techniques for developing communication and working relationships between parents and teachers through experiences in a variety of settings. Prereq: 3210 or Home Economics 1510. W

4430 Family Relationships (3) Interpersonal relationships among family members and societal roles. Prereq: 3510 or 3515. Sp

4810 Child in the Community (3) Needs of children; community agencies meeting these needs; visits to agencies contributing to the welfare of children. Prereq: 2110 or Home Economics 1510 or equivalent. W

4620 Administration of Programs for Young Children (3) Planning for staffing, housing, feeding, scheduling, and financing of day care facilities for infants and young children, nursery school programs, and special programs for deprived preschool children. Prereq: 3350 or 4110.

4710 Contemporary Developments (1-3) Student or staff-initiated course for study of special topic(s) pertinent to the field; topics selected to be determined by students and instructor with departmental approval. Elective credit only. Prereq: Consent of instructor. May be repeated with departmental approval. Maximum 9 hrs.

4810 Afro-American Families (3) Historical background, contemporary family structure and relationships; emerging needs and programs. Prereq: 4 hrs in social sciences.

4830 Consumers and the Market (3) Analysis of elements in marketplace which create problems for consumers. Special attention is given to consumer decision making, need for information and constraints on opportunity associated with consumer protection of consumers. Prereq: Economics 2110. W. Sp

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered in the University for any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated as needed. S/NC only. E

5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in consumer studies. Prereq: Consent of instructor. S/NC only. E

5110 Field Work in Family Life (3) School and community programs concerned with education for family living. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E

5140 Consumption and Standards of Living (3) Economic and welfare aspects of consumption. Analysis of factors associated with changes in the standard of living. Review of major consumption studies. Prereq: 4850 or 5170 or consent of instructor.

5160 Assessment of Family Behavior (3) Methods of measurement related to study of family. Current methodological issues. Prereq: 5410 or 5530 or consent of instructor.

5170 Consumer Economics (3) Consumer functions in economy; structure of consumer markets; government action relating to consumers; factors affecting prices of consumer goods.

5174 Public Consumption (3) Relationships between consumers and public sector. Market system failures from consumer perspective. Government reverence; students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development, 3 hrs family relationships, 3 hrs sociology. 2 hrs and 1 lab.

5310 Theory and Research on Human Sexuality (3) Cultural, social, and psychological dimensions of human sexuality. Major contributions from anthropological, sociological, and personality theory and research.

5410 Advanced Family Relationships (3) Problems in modern family life; individual adjustments, group relationships. Prereq: 3515, 4430, or consent of instructor.

5420 Parents and Children (3) Common problems of young children faced by parents and teachers; emphasis on methods available to modify problem behavior.

5430 Families in Crisis (3) Interpersonal transactions in disordered family behavior. Prereq: 5410 or equivalent. W

5510 Survey of Research in Child and Family Studies (3) Research literature; locating, abstracting, reporting research studies. Prereq: 3515 or 4430 or consent of instructor. W

5630 Research Methods in Child and Family Studies (4) Research procedures in child and family behavior; basic methodology of behavioral sciences. Research techniques to help in beginning research work in this area. Prereq: 9 hrs child development and family studies or preschool education. Sp

5640 Teaching Child and Family Studies (5) Seminar in Individual and Family Development-Phy- siological Determinants (3) Family members' physiological potential, development, and status. Family's contribution to members' physiological potential, development, and status. Family's contribution to members' physiological potential, development, and status. Families in crisis; students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development, 3 hrs family relationships, 3 hrs sociology. 2 hrs and 1 lab.


5800 Children's Effects on Parents and Marriage (3) Theory and research about how children change parents and influence marital relationships. Prereq: 4430 or consent of instructor.

5850 Children's Effects on Parents and Marriage (3) Theory and research about how children change parents and influence marital relationships. Prereq: 4430 or consent of instructor.

5900 Seminar in Child and Family Studies (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5910 Research Seminar (1-2) Required 1 hr for M.S. students, 2 hrs for Ph.D. students. S/NC only. E


6250 Advanced Topics (3) Individual study and group discussion of current problems. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6310 Individual and Family Development—Physiological Determinants (3) Family members' physiological potential, development, and status. Status of family's contribution to members' physiological potential, development, and status. Families in crisis; students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development and family studies, 4 hrs nutrition, 4 hrs psychology, or equivalent. Sp

6320 Individual and Family Development: Cogni- tion (3) Processes through which human individuals learn to recognize their world. Cognitive processes involved in development across life span, focus on research findings and methodology. Prereq: 5210, 5530, 5630, or equivalent. W

6330 Individual and Family Development: Socialization (3) Processes of socialization throughout life cycle. Family as primary socializing agent. Prereq: 3515, 4430 or equivalent. F, W.

6410 Theory Construction in Family Studies (3) Process and application of theory construction in contemporary research areas and family studies. Emphasis on understanding, criticizing and constructing theoretical models based on research findings. Prereq: 5410 or consent of instructor.

6450 Conceptual Frameworks for the Family (3) Theoretical perspectives for understanding families. Exploration and applications of frameworks on theoretical and research levels. Historical to contemporary development of family studies. Prereq: 5410 or consent of instructor. Sp

6540 Seminar in Programs for Infants and Pre- School Children (3) Research related to programs for infants and young children. Various program models for education of infants and young children, methods of working with parents, and student training programs. Prereq: 5210, 5540 or equivalent.

6610-20 Applied Behavior Analysis in Natural Settings (3, 3) Individual supervision in application of applied behavior analysis in natural settings. Prereq: 5420 or consent of instructor.

6710 Elements of Consumer Choice (3) Analysis of consumer decision making, theory of consumer choice, consumer processes, and reconsideration of dynamic aspects of consumer behavior, including roles of aspirations, expectations, uncertainty and information. Prereq: 5170 or consent of instructor.

6730 Urban Consumers (3) Focus on how consumers function in an urban economy. Urban growth and land use from consumer perspective. Relationship between consumers and local government. Prereq: 5170 or consent of instructor.

Home Economics

MAJOR

Home Economics

DEGREE

Ph.D.

5060 Practicum (1-12) Field experience in selected organizations that focus on interdisciplinary solutions to multifaceted problems of society. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5100 International Studies (1-18) Student- or staff-initiated course for study in foreign country of topic(s) pertinent to field. Topic to be determined by student and instructor with department and college approval. May be repeated. Maximum 15 hrs.

5210 History and Philosophy of Home Eco- nomics (3) Historical development of home economics; survey of concepts and philosophy of component disciplines and analysis of current trends; emphasis on projection of future developments.

5220 Development of Community Services Pro- grams (3)

5230 Evaluation of Community Services Pro- grams (3) Purposes of evaluation, clarification of objectives and procedures for determining progress.

5700 Current Programs and Trends in Human Re- source Development (1-3) Current developments in area related to human resources and impact on society through community services programs and other programs in education, business, and government. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5800 Problems in Community Services (1-3) Prereq: Consent of professor in charge of investigation. Hrs and credit to be arranged. May be repeated. Maximum 9 hrs.

5900 Seminar in Human Resource Development (1-3) May be repeated. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Theoretical Issues in Human Resource Development (3, 3) Interdisciplinary approach to de- velopment of theory and use of theory in area related to human resources and consumer problems. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics. F, W.

6210 Professional Issues in Human Resource De- velopment (1) Role and philosophy, and administr- ative procedures for human resource development. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics. Sp

6310 Advanced Topics (3) Comprehensive individual study and group discussion of individual and family behavior, physiological development and well-being, environmental factors, and economic and social well-being. Prereq: 6110. May be repeated.

6500 Methodological Issues in Home Economics (3) Advanced methodology in home economics, interdisciplinary research methods and issues. Prereq: 1 graduate-level course in research methodology or consent of instructor.

6900 Seminar (1-3) May be repeated. S/NC only.

Home Economics Education

The graduate program in Home Economics Education is administered by the College of Education with home economics education being one of the five service areas within the
Nutrition and Food Sciences

MAJORS
- Food Science
- Nutrition
- Food Systems Administration
- Home Economics

DEGREES
- M.S.
- M.S.W.
- Ph.D.

Professors:
- B. L. Beach, Ph.D. Wisconsin; R. E. Beauchane Ph.D., Kansas State; B. R. Carruth (Head), Ph.D.
- Missouri; J. M. Hitchcock, Ph.D. Wisconsin; J. D. Osburn, Ph.D. Wisconsin; J. R. Savage, Ph.D. Wisconsin; J. T. Smith, Ph.D. Missouri; A. M. Smith (Memphis), Ph.D. Tennessee.

Associate Professors:

Assistant Professors:
- F. C. Andrews (Assistant Dean), Ph.D. Ohio State.
- J. B. Bittle (Memphis), Ph.D. Pennsylvania.
- M. D. Brooks (Memphis), M.S. Alabama.
- G. W. Dawes, Ph.D. Tennessee; R. R. Evans, M.A. Kentucky; J. D. Skinner, Ph.D. Oregon State.

Ph.D. Tennessee.

Food Science

4600 Origin of Food and Foodways (3) Food origin and development of individual and group foodways. Prereq: 8 hrs social science or humanities. F, W

4010 Introductory Experimental Food Science (3) Physical and sensory evaluation in experimentation with fats, high protein foods, and batter and dough systems. Prereq: 3510. 2 hrs and 1 lab. W, Sp

4602 Experimental Food Science (3) Individual experimentation and its relation to the research literature. Prereq: 4010, Nutrition 3320 recommended. 1 hr and 2 labs. Sp

4640 Food in Contemporary Society (2) Consumer's options, responsibility and potential influence with respect to food supply. F, Su

4100 Food Preservation (3) Application of basic principles of food preservation in home. Prereq: 1010, 4 hrs microbiology, and Nutrition 3310 or equivalent. 2 hrs and 1 lab.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5140 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemistry of colloid state; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: Nutrition 3330 and Mathematics 1540 or equivalent. Sp, A

5510 Food Texture (3) Classification of foods according to textural parameters; instrumentation in evaluation of textures. Prereq: 4010 or Food Technology 4920; Plant and Soil Science 3610 or equivalent; or consent of instructor. F

5550 Food Behavior of the Individual (3) Development of and changes in choices of food and food habits of individuals. Prereq: 3500, 3 hrs of nutrition, or consent of instructor. Sp, or Su

5560 Foodways in the United States (3) Current foodways of selected subcultures in United States and historical basis for their development. Prereq: 4000, 3 hrs of nutrition, or consent of instructor. W, Sp

5610-20 Advanced Food Science (3, 3) Biochemical and biological interactions in food. Prereq: 4010; Nutrition 3320 or equivalent, or consent of instructor. W, Sp

5630 Carbohydrates and Fats in Relation to Food Science (3) Physical and chemical characteristics of fats, starches, and fats with emphasis on their behavior in food. Prereq: 4010, Nutrition 3320-30 or equivalent.

5640 Proteins in Relation to Food Science (3) Physical and chemical characteristics of the proteins of milk, eggs, flour, and meat with emphasis on their behavior in food. Prereq: 4010; Nutrition 3320-30 or equivalent.

5700 Current Programs and Trends in Food Science (1-3) Recent advances in food science; impact on curricular requirements, and implications for teachers, extension workers, and dietitians. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Science (1-3) Advanced study from list below. Prereq: Consent of instructor. May be repeated.

5850 Food Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110 Advanced Topics in Food Science (3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: Consent of department head and professor in charge of investigation. May be repeated.

6210 Food Dispersions (3) Physical characteristics of solutions, colloidal dispersions, and suspensions in relation to treatments applied. Prereq: 5530.

6310-20 Structure of Food Plants and Animal Tissues (3, 3) Histological structure of food plants and animal tissues related to physical characteristics, impact and chemical properties of components. Prereq: 5630-40.

6510-20 Food and Sociocultural Change (3, 3) Critical evaluation of food consumption. Impact of cultural and endocrine function. Prereq: 5550 or 5560; or consent of instructor. F

6900 Seminar (1-3) May be repeated. S/NC only. E

Nutrition

3310 Organic Chemistry (4) Emphasis on subjects leading to 3320-30, Textiles and Clothing 4220. Prereq: General Chemistry 3 hrs and 1 lab. Not for graduate credit to departmental majors. F, Sp

3320 Food Analysis (4) Elementary quantitative analysis; typical food analyses. Prereq: 3310 or equivalent. 3 hrs and 1 lab. Not for graduate credit to departmental majors. W, Su

3330 Physiological Chemistry (3) Metabolism of carbohydrates, fats, and proteins. Role of vitamins and minerals in metabolism. Not for graduate credit to departmental majors. Sp, Su

3339 Physiological Chemistry Laboratory (1) Prereq: 3320; Consent. 1 lab. Not for graduate credit to departmental majors. Sp, Su

4010 Reproductive and Developmental Nutrition (3) Nutritive requirements for expectant mothers, infants, and preschool children. Prereq: 3020, 3050, or 3410. 2 hrs and 1 lab. F

4020 Nutrition for Children, Adolescents and Adults (3) Application of basic principles and recent research findings to nutrition of children, adolescents and adults. Prereq: 3020, 3050, or 3410. 2 hrs and 1 lab.

4030 Community Nutrition (3) Nutrition problems and services in the community and their personal experiences are integral part of the course. Prereq: 3020, 3050, or 3410. Sp

4110 Introduction to Nutrition Research (3) Discussion of principles and laboratory experiences. Prereq: 3410 or equivalent. 2 hrs and 1 lab. Sp

4230 Nutrition in Disease (4) Nutrition problems in diseases influenced by diet. Prereq: 3410. W, Su

4231 Clinical Experiences in Dietetics (1) Planned clinical experiences applying principles of nutrition in disease. Coreq: 4230. Su

4240 Nutrition in Disease II (3) Interdisciplinary lectures of proteins, carbohydrates and lipids; chemistry of normal and diseased organs and/or tissues and the dietary or behavior modifications required. Prereq: 4230. Designed for senior students in the coordinated undergraduate program in dietetics. F

4430 Diet and Drug Therapy (3) Effect of drug therapy on absorption and utilization of nutrients, and effect of diet on absorption, utilization and toxicity of drugs. Prereq: 3410 or consent of instructor. W

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5110 Advanced Physiological Chemistry (4) Bioenergetics and related metabolism of nutrients. Prereq: 3410. 3 hrs and 1 lab. F


5230 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. Prereq: 3320-30, 3410. 2 hrs and 1 lab. F

5240-50 Research Techniques (3, 3) Human metabolic balance experiments. Analytical methods for assay of food and biological materials. Prereq 5250. 3 labs. A

5310 Community Nutrition (3) Nutrition problems and practices in community; supervised field work. Prereq: 3410 and consent of instructor. 3 labs. F

5320 Community Nutrition (3) Observations and participation in nutrition programs of local and state agencies. Prereq: 5310 and consent of instructor. 3 labs. W

5330 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of instructor. 3 labs. Su

5340 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state and regional community nutrition program. Location of in-depth study to be selected in consultation with instructor. Prereq: 5320 and consent of instructor. S/NC only. Sp

5350 Mental Retardation or Other Developmental Disabilities of Childhood (3) Multidisciplinary core course. Required of all students matriculating at Child Development Center, UT Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp
5410-20 Human Nutrition (3, 3) Functions of carbohydrates, proteins, fats, minerals and vitamins. Nutritional requirements of humans throughout life span and practical problems in meeting requirements. Prereq: 3410 and 5110. W, Su

5430 Physiological Bases for Diets in Disease (3) Developments in dietary treatment of disease in which nutrition plays a major role. Prereq: 5210 or equivalent. Su


5450 Survey Methods in Human Nutrition (3) Food collection and analysis; the design of questionnaires and nutritional typology of population groups. Prereq: 5210 or 5410-20. 2 hrs and 1 lab.

5460 World Food Supply and Human Nutrition (3) Food supplies and food practices as related to human nutrition throughout the world. Regional, national and international agencies concerned with food and nutrition problems. Prereq: 5210 or 5410-20. Sp

5470 Nutrition and Aging (3) Nutritional problems of aging individual, nutritional requirements, dietary intakes, and effect of nutrition on rate of biological aging. Prereq: 5210 or consent of instructor. W

5610 Nutrition in Mental Retardation and Developmental Disorders (1-12) Interdisciplinary diagnosis and treatment of developmentally-handicapped child. Role of nutritionist: clinical experience and lectures at Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head. E


5800 Problems in Nutrition (1-3) Advanced study selected from field of nutrition. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110 Proteins and Amino Acids (3) Lectures, reports, and discussions. Prereq: 5410-20. Sp, A

6120 Mineral Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20. Sp, A

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20.

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20.

6210 Advanced Topics in Nutrition (1-3) Recent advances, concepts, research techniques, and current problems. Prereq: 5410-20 or consent of instructor. May be repeated. Maximum 9 hrs. F

6500 Seminar (1-3) May be repeated. Maximum 9 hrs. S/NC only. E

Food Systems Administration

4130 Food Systems Administration (3) Functions of management applied to food service systems. Prereq: 3110. F

4140 Food Systems Personnel Development (3) Development of training programs for food systems personnel. Prereq: 4130 or consent of instructor. W

4150 Design and Layout of Food Service Systems (3) Design of physical facilities and selection and purchasing of equipment for food service systems. Prereq: 4130. F

4260 Food and Lodging Managerial Cost Control (3) Cost analysis for control. Use of financial statements for decision making for food and lodging systems. Prereq: 4130, Accounting 2130. W, Sp

4260 Food and Lodging Physical Plant, Planning and Maintenance (4) Feasibility, planning, development and construction of food and lodging physical plant and maintenance. Electrical, mechanical, heating, plumbing, air conditioning and ventilation and illumination systems. Types of building materials and construction. Prereq: 3110, 4150 or consent of instructor. 3 hrs and 1 lab.

4270 Tourism, Food and Lodging Information Systems (3) Qualitative and quantitative analysis of information systems for decision making in food and lodging operations or other operations related to tourist industry. Prereq: 4130, 4250, Computer Science 1410. Sp

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5110-20 Experimental Food Supply (3, 3) Analysis of food production, holding environment, and service problems related to quality of food prepared in volume. Prereq: 5110, 3110, or consent of instructor. F

5210 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 4130, Statistics 5211 or equivalent. W, A

5220 Experimental Design of Food Systems Facilities (3) Environment in which food is prepared, held, and served in volume. Prereq: 4150.

5230 Food Systems Evaluation (3) Management resources in food systems. Standards for control. Prereq: 4130, or consent of instructor. F


5310 Administration of Food Service Delivery Systems (3) Role and responsibilities of administrator in maintaining desired quality and quantitative standards in food service delivery system. Prereq: 4130 or consent of instructor. W, A

5500 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques in clinical settings by nurses and dietitians for training of entry-level health care workers. Prereq: Nursing 4760 or consent of instructor. Sp

5700 Current Programs and Trends in Food Systems Administration (1-3) Recent advances in food systems administration and implications for dietitians, school food service directors, and others in related fields. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Systems Administration (1-3) May be repeated.

5850 Field Experience (3-6) Planned administrative experience in food service system. Prereq: Consent of instructor.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6110 Advanced Topics in Food Systems Administration (3) Comprehensive individual study and group discussion of current problems in food systems administration. Prereq: Consent of instructor.

6210 Manpower Planning and Training for the Food Service Industry (3) Identification of manpower needs by skill level; programs for personnel in food service industry. Prereq: 4140, 5210 or consent of instructor. Sp

6310-20 Quantitative Methods to Control Resource in Food Service Systems (3, 3) Interrelationships of resources and evaluation of efficiency and effectiveness in food service systems. Prereq: 5230 or consent of instructor. Taken in sequence. Credit for 6310 contingent upon completion of 6320. F, A

6900 Seminar (1-3) May be repeated. S/NC only. E

Textiles, Merchandising, and Design

MAJORS

Textiles and Clothing

Degree: M.S.

Interior Design and Housing

Degree: M.S.

Consumer Studies and Development

Public Policy

Degree: M.S.

Home Economics

Ph.D.

Professors:

R. G. Blakemore, Ph.D Florida State; J. O. De Jonge (Retired); Ph.D Loyola; B. C. Goswami, Ph.D. Manchester (England).

Associate Professors:


Faculty Associate:

T. L. Vigo, Ph.D. Tulane.

Assistant Professors:

C. E. Cox, Jr., Ph.D. Tennessee; S. Dillard, M.S. Tennessee; L. A. Kocher, Ph.D. California (Davis); D. G. McCurry, M.S. California State.

Interior Design and Housing

A student's course of study may include intensive training in interior design before and during an undergraduate program, behavioral design research, and/or history and preservation of interior architecture. Students interested in Housing may elect an interdisciplinary program in Consumer Studies and Housing Public Policy.

ACQUISITIONS AND EXHIBITIONS

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.

4320 Family Housing Problems (3) Housing requirements of families. Reading and judging housing plans; effective use of space; maintenance problems; housing regulations and restrictions; site selection and neighborhood development; financing procedures. Prereq: 6 hrs from Economics 2110-20-30. Sp

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5400 Seminar in Design (2) Intensive reading, discussion and critical evaluation of twentieth-century design concepts, persons, motivation, and creative components leading to visual innovation.

5500 Advanced Design Studio (4) Structural, variational, and form potentials of design materials; search for aesthetic potential in depth.

5600 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in housing.

5810 Historic Interior Design (3) Research studies of historic design in interior design; emphasis on course content, emphasis on interior design, furniture and/or accessories for England, Scandinavia, Mediterranean area and/or America. May be repeated. Maximum 18 hrs.

5810 Furniture Appreciation (3) Aesthetic qualities of past and present styles. Significant structural and formal characteristics.

5910 Interior Design (3) Advanced problems in...
planning and design of interior space; applications of research in directing design decision.

Prereq: Consent of instructor.

5410 Advanced Problems (3) Individual development of techniques and appreciation. Prereq: 9 hrs related art or equivalent.

5510 Environmental Factors in Interior Design (3) Human factors and associated research techniques related to design of interior environmental settings—derivation of design implications from analysis of sociology, psychology, and behavioral sciences. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5520 Environmental Factors in Interior Design (3) System and design methodology as applied to design of microenvironments using human factors information. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5530 Environmental Factors in Interior Design (3) Human factors and systematic design methodology applied to analysis, synthesis, and evaluation of research-oriented interior design projects. Comprehensive design research projects by 2- or 3-member teams. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5610 Furniture Design (3) Analysis of human factors to better meet functional, psychological, and physical convenience, surface treatment, facilities and costs; problems of installation and remodeling.

5615 Housing Management (3) Role and functions of homeowner with respect to private and assisted housing management. Prereq: 4320 or consent of instructor.

5614 Housing Regulations and Controls (3) Functions, regulations and other control practices and mechanisms as determinants of nature, availability of housing in local communities by various user groups. Prereq: 4320 or consent of instructor.

5620 Experimental Methods in Household Equipment (3) Research methods and techniques in determining performance of household equipment. Prereq: 2430 or consent of instructor, 1 hr and 2 labs.

5630 Environmental Requirements for Family Work Centers (3) Trends in planning work center and methodological approaches to developing environments; advocacy; convenience, surface treatment, facilities and costs; problems of installation and remodeling.

5618 Environmental Design Research (1-3) Evaluating, regulating, and other control practices and methodologies of interior design problems. Hours and credit arranged. Prereq: 5510-20-30 or equivalent and consent of department head and instructor in charge of investigation. May be repeated. Maximum 9 hrs.

5620 Interior Design (1-3) Advanced study in interior design. Hours and credit arranged. Prereq: Consent of department head and professor in charge of investigation. May be repeated. 

Maximum 9 hrs. E

5630 Problems in Housing (1-3) Advanced study in housing. Hours and credit arranged. Prereq: Consent of department head and professor in charge of investigation. Prereq: Consent of instructor. Maximum 9 hrs. E

5910-20-30 Seminar (1-4, 1-4, 1-4) Hours and credit arranged. Prereq: Consent of instructor.

6110 Contemporary Housing Issues and Problems (3) Individual study and group discussion of various issues and problems related to housing. Prereq: Consent of instructor.

6120 Advanced Topics in Housing Research (3) Various concepts, theories and methodologies of social sciences in housing research. Prereq: Consent of instructor.

6210 Environmental Design Analysis (3) Advanced methodology in psychology of environmental design, multidisciplinary research data and methods. Prereq: 5510-20-30.

6420 Perspectives in Interior Design (3) Historical influences related to contemporary concepts in interior design. Prereq: 5540, 6 hrs of graduate level art history, or consent of instructor.

Textiles and Clothing

4210 Elementary Textile Microscopy (3) Microscopic techniques as applied to the study of textile fibers and fabrics. Prereq: 4010. 1 hr and 2 labs. W, A

4280 Design Analysis: Functional Apparel (3) Systematic approach to apparel design integrating aesthetic, psychological, social and physiological aspects of apparel problems for special reference groups. Garment specifications translated for production. W

4410 Apparel Production Mangement (3) Management perspective of apparel production industry: production planning, process, and management of intran resources. Plant tours and case studies on production problems. Field trips required, S

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses in a non-curricular way time and faculty dollars before degree is completed. May not be used toward degree requirement. May be repeated. S/NC only.

5110 Textiles Testing and Methods of Research in Textiles (3) Physical and chemical testing. Research methods. 3 labs. S

5120 Advanced Problems in Textiles and Clothing (3) Refresh course; new developments in textiles. Selecting fabrics, agencies aiding consumer, and individual problems in textile field. 2 hrs and 1 lab. F

5130 Advanced Tailoring (3) Comparison of hand tailoring and trade methods used in making suits, coats, or costumes. 3 labs.

5150 Principles of Design Analysis (3) Application of flat pattern theory to garment design incorporating relationships of fabric geometry, texture, hand, and surface ornamentation to design. Prereq: Consent of instructor. 1 hr and 2 labs. W

5160 Review of Literature (3) Intensive survey and evaluation of recent literature: implications for further research. F

5170 Social, Psychological and Economic Aspects of Clothing (3) Clothing as it relates to human behavior. Prereq: 6 hrs or equivalent from each of following areas: sociology, psychology, economics. W

5180 Advanced Textile Economics (3) Economic problems or problem areas of current importance in textile and apparel industries—production, consumption, and governmental policy. Prereq: 3420, 6 hrs economics or consent of instructor. W

5210 Evaluation of Instructional Materials in the Field of Textiles and Clothing (3) Evaluating instructional materials in communicating information in various areas of textiles and clothing. 1 hr and 2 labs.

5220 Historic Textiles (3) Development of textile industry in world; fibers used, design, and color. F

5240 Practicum (1-9) Off-campus experience with business, industry, governmental agencies and civic groups; preplanned; supervised. Prereq: Consent of major advisor and department head. May be repeated. Maximum 9 hrs. S/N/NC only.

5250-60-70 Problems in Textile Chemistry (4, 4, 4) Theoretical and experimental study of chemistry of textile fibers including polymerization, reactions, formation, types of spinning and finishing. 5250 must be taken first, 5260 and 5270 need not be taken in sequence. 5250—Emphasis on structure; property relationships and reactions of fibers. 5260—Emphasis on fabric finishes. 5270—Emphasis on dyes and dyeing. Pre-

req: 3420 or equivalent; 1 yr organic chemistry. 2 hrs and 2 labs.

5310 Fashion Analysis (3) Fashion and social and economic force, evolutionary theories of fashion operation. Prereq: 6 hrs each of sociology and economics.

5320 Problems in Historic Costume (3) Variable flow of styles in relation to cultural determinants. Prereq: 3480 or consent of instructor. May be repeated. Maximum 9 hrs. W

5610 Textile Processing (3) Methods and mechanics of texturing continuous filament yarns, methods and mechanics of processing staple yarns, spinning system, composite yarns weaving, knitting, non-woven fabric formation. Prereq: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5610.)


5700 Current Programs and Trends in Textiles and Clothing (1-3) Pertinent developments and trends in textiles and clothing and implications for new type of programs, techniques and/or curriculum approaches. Content and emphasis vary according to changes in field and needs of groups serviced. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5800 Problems in Textiles and Clothing (1-3) Advanced study selected from field of textiles and clothing. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5900 Seminar in Textiles and Clothing (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E


6110 Selected Issues in Textiles and Clothing (3) Advanced topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6140 Selected Behavioral Theories in Clothing (3) Role of clothing in functioning of people, utilizing behavioral theories. Prereq: 5750, 6 hrs of graduate level sociology or psychology, or consent of instructor.

6150 Social-Psychological Theories of Clothing Consumption (3) Analysis and evaluation of social science theories of consumer behavior in relation to textiles and apparel. Prereq: Consent of Family Studies 5170, 6 hrs of graduate level sociology or psychology, or consent of instructor.

6160 Textile Flammability (3) Factors affecting textile flammability as consumer issue. Standards, regulations, test methods, economic impact. Prereq: 5120, 5180, 5250, or consent of instructor.

6170 Physical Performance Behavior of Textile Structures I (3) Fundamentals of yarn and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.

6190 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hrs.

6200 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hrs.

6210 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hrs.
Intercollegiate Programs

Aviation Systems

MAJOR
Aviation Systems

DEGREE
M.S.

Lead Professor:
M. A. Wright, Ph.D. Wales.

Professors:
W. Frost, Ph.D. Washington; W. F. Jacobs, Ph.D. Gottingen (Germany); A. A. Mason, Ph.D. Tennessee; J. M. Wu, Ph.D. California Institute of Technology; R. L. Young, Ph.D. Northwestern.

Associate Professors:
F. G. Collins, Ph.D. California (Berkeley); R. D. Kimberlin, M.S. Tennessee; J. R. Maue, Ph.D. North Carolina State.

Assistant Professors:
W. B. Baker, Jr., Ph.D. Tennessee; V. K. Smith, III, Ph.D. Georgia Institute of Technology.

The University of Tennessee Space Institute offers a program leading to the Master of Science in 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 various phases pertinent to aviation. The program features 18 quarter hours major field credit in various aspects of aviation systems, 6 or more quarter hours in Economics 5030 and Accounting 5810, for a total of 12 quarter hours major field credit in various aspects of aviation systems.

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

1. 18 hours in the major field of aviation systems.
2. For the research and development area, 6 quarter hours in Industrial Engineering 5700 and 5710; for the administration area, 6 quarter hours in Economics 5030 and Accounting 5810, for a total of 12 quarter hours.
3. 6 hours of electives selected from the major field, engineering and/or the areas in item 2.
4. 9 hours in Aviation Systems 5000, Thesis, hence 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 minimum requirements:

1. 18 hours in the major field of aviation systems.
2. For the research and development area, 9 quarter hours in Industrial Engineering 5700, 5710, and 5720; for the administration area, 9 quarter hours in Economics 5030, Accounting 5810 and Finance 5010-20, for a total of 18 quarter hours.
3. 6 hours of electives in one of the areas in item 2.
4. 6 hours of electives in the major field, engineering and/or the areas of item 2.
5. Satisfactory completion of 3 quarter hours in Aviation Systems 5100, Project in Aviation Systems.
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 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.

Courses suitable for credit in the major field include:

- Aerospace Engineering 5810 and 5820, Industrial Engineering 5840; Aviation Systems 5070, 5080, 5090, 5210, 5220, and 5570.
- Electives typical of those suitable for credit in the area of aviation systems, research and development include: Aerospace Engineering 5150-60-70; Computer Science 3510-20, 4550 and 5650; Industrial Engineering 4060, 4150, 4230, 5720, 5730, 6700, 6730; Mathematics 4225-35-45, 4510-20-30; Metallurgical Engineering 5810-20-30; and Statistics 3450.
- Electives typical of those suitable for credit in the area of aviation systems, administration include: Accounting 5020; Business Law 5010; Economics 5020; Management 5130; Marketing 5010-20; Transportation 5050, 5130, 5210-20, and 5910.

5000 Thesis (1-15) E

5070 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket handling, Airport management, economics and logistics. Interfaces with the community, collection and distribution, demand requirement analyses, types of developments and their projections. Prereq: Aerospace Engineering 5810.

5080 Collection and Distribution (3) Capabilities, technology, plans, programs and developments for collecting and distributing passengers and freight to and from various types of airports. Ground, water, air and mixed transportation modes, present and future; requirements analysis, and model analysis of the system. Prereq: Aerospace Engineering 5810.

5090 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulatory agencies, organizational structure and administrative and enforcement procedures. Prereq: Aerospace Engineering 5810.

5100 Project in Aviation Systems (3) In-depth study and formal report on aviation systems topics, normally performed during last quarter of work toward degree in non-thesis program. For aviation systems degree candidates only.

5210-20 Experimental Flight Mechanics (3, 1) Flight mechanics, experimental techniques. Special- ly-equipped airborne laboratory allows active student participation in series of experiments demonstrating acquisition of flight test data. Tests con-
Comparative and Experimental Medicine

MAJOR DEGREES

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

Joint Graduate Coordinating Committee

H. Kitchen (Chairperson); C. C. Congdon; J. E. Fuhr; M. Holland; R. L. Haynes

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 intercollege 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, Hemophilic Clinic, Birth Defect Clinic, Aberrant Metabolism Laboratory, and Hematology and Oncology services. For specific course listings please see College of Veterinary Medicine, page 31 and College of Medicine—Knoxville Unit, page 143 in this catalog.

ADMISSION REQUIREMENTS

General Requirements

Admission requirements of The Graduate School of The University of Tennessee, Knoxville will apply. In addition, all applicants will be required to submit two official transcripts from all institutions attended and three letters of recommendation from individuals who are familiar with their scholastic or professional backgrounds.

Requirements for Admission to the Master of Science Degree Program

Successful applicants will be scholastically qualified students with a baccalaureate degree in the life sciences and should have completed course work including chemistry through organic, mathematics through calculus, one year of physics, one year of basic biology, plus advanced studies in biology including courses such as biochemistry, anatomy, histology, cell biology, or others that are appropriate for individuals aspiring to research careers in the biomedical sciences. Students with professional degrees will have most of the above requirements so that entrance to graduate training usually will occur at the doctoral level.

All applicants for M.S. programs, except those with a professional degree, will be required to present evidence of satisfactory performance on the Graduate Record Examination.

Requirements for Admission to the Doctor of Philosophy Degree Program

Applicants for admission to a doctoral program will be expected to have a Master's degree in one of the biological sciences or a professional degree in one of the medical sciences.

Selected individuals with strong backgrounds in the physical and biological sciences who have the baccalaureate degree may be admitted upon presenting evidence of satisfactory performance on the Graduate Record Examination and, in addition, must obtain the approval of the Joint Graduate Coordinating Committee of the Comparative and Experimental Medicine program.

Exceptions to above requirements may be made at the discretion of the Joint Graduate Coordinating Committee if the minimal requirements of The Graduate School have been met and the student is admitted to graduate programs but who are lacking in course requirements will be required to correct these deficiencies early in their graduate programs as directed by the Joint Graduate Coordinating Committee.

For additional information, see sections in this catalog on College of Veterinary Medicine and College of Medicine—Knoxville Unit, or write to Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, Tennessee 37901.

Ecology

MAJOR DEGREES

D. L. Bunting, Chairman, Ph.D. Oklahoma State University

The Graduate Program in Ecology offers Master of Science and Doctor of Philosophy degrees. This interdepartmental program provides advanced courses in contemporary 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 valuable research 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) at least 12 quarter hours of college chemistry, 9 quarter hours of college mathematics, and 4 quarter hours of ecology at the upper division level; (3) departmental application and 3 rating forms; (4) the Graduate Record Examination. Application forms for admission should be obtained from The Graduate School. Inquiries concerning the admission requirements should be addressed to the Chairperson, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37916.

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 chairperson of the program on the choice of a faculty advisor who will become the chairperson of the student's faculty committee.

THE MASTER'S PROGRAM

The minimum 45 quarter hours of graduate credit shall include 18 hours of ecology courses (exclusive of thesis), of which 6 hours shall be in Ecology 5210-20-30 and at least 8 additional hours in ecology courses numbered above 5100; 9 hours of thesis in Ecology 5000, and 18 additional hours in ecology or supporting courses. To insure an interdepartmental program, the required minimum 45 hours shall include no more than 18 hours of non-thesis courses from any one department of instruction.

The general requirements for this Master's degree are listed on page 18. A minor in ecology is available.

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 5210-20-30 and a minimum of 9 quarter hours of courses numbered above 6000. A student cannot enroll for dissertation until the research plan has been discussed and approved by the doctoral committee. A foreign language is required.

Shared Faculty


5000 Thesis (1-15) E

5100 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 3 hrs.

5210-30 Principles of Ecology (2, 2, 2) Theories and problems in ecology. Comparisons between land, freshwater, and marine environments, including humanity's role in the world's ecosystems. Must be taken in sequence. Prereq: 4 hrs of ecology at the upper division level.

5310 Ecology for Planners and Engineers (3) Ecological principles and their effects on human choice, including water quality issues. Lectures, field trips. For students in Graduate School of Planning and Environmental Engineering.

5320 Implementation of Environmental Policy (3) Goals and problems of environmental legislation, especially National Environmental Policy Act; purpose, preparation, and evaluation of environmental impact statements and similar multidisciplinary studies. Prereq: 5210 or 5310, or Environmental Engineering 4620.

5610 Environmental Toxicology (3) Same as Biochemistry 5610.

5640 Techniques in Environmental Toxicology (2) (Same as Biochemistry 5640).

6000 Doctoral Research and Dissertation (3-15) E

6100 Special Topics in Ecology (3) Seminars on advanced topics and recent developments in ecology. Prereq: Consent of instructor. May be repeated.

6110 Seminar in Animal Behavior (2)

6120 Seminar in Aquatic Ecology (2)

6130 Seminar in Physiological Ecology (2)

6140 Seminar in Community Ecology (2)

6150 Seminar in Radiation Ecology (2)

6160 Seminar in Systems Ecology (2)

6431 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 6431).

Industrial and Organizational Psychology

MAJOR DEGREES

Industrial and Organizational Psychology

M.S., Ph.D.

Committee: J. M. Larsen, Jr. (Chairperson); W. H. Calhoun; F. A. Chambin; H. D. Dewhurst; R. T. Ladd; J. W. Lounsberry; D. E. Sundstrom; D. J. Wheeler; G. H. Whittuck.

(For complete Faculty Listing, see Departments of Management and Psychology)

The Master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research, for university teaching, and for consulting relationships with industry. Admission is based upon applied research utilizing a thoroughly theoretical background, including classical and modern organization theory, organizational behavior, psychology, and management. The programs are administered by a joint committee of the two departments, appointed by the Vice Chancellor for Graduate Studies and Research on recommendations from the two department heads.

It is intended that students entering the program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses which will assist the student to attain a reasonable level of sophistication in areas of deficiency.

ADMISSION PROCEDURE

Applicants for admission should request forms and materials from both the Graduate Office and the Office of Industrial and Organizational Psychology Program, 413 Stokely Center for Management Studies, Knoxville, Tennessee 37916.

Two separate applications must be completed: one for the application for admission to The Graduate School (apply for major in "Industrial and Organizational Psychology") and one application for admission to the Industrial and Organizational Psychology program. Deadline: For fall entrance all materials should be received by the Graduate Office no later than March 1 if financial assistance is desired. Standards: At least 9 quarter hours of college mathematics and one course in statistics are required. Ordinarily, an undergraduate grade-point average of 2.5 or above is required, with no evidence of special weakness in mathematics and physical sciences.

Test scores on each section of the aptitude portion and the Advanced Psychology portion of the GRE are required. Customarily, those students applying to this program have performed at or above the 63rd to 65th percentile on the aptitude tests. (This corresponds to a raw score of approximately 500 on each of the tests.) The GRE Advanced Psychology score will be used in making admission decisions, although special consideration will be given in the case of non-psychology majors.

THE MASTER’S PROGRAM

I. Course Requirements (Currently under review and subject to change for Fall 1982 entrants)

A. Management or Psychology 5170, 5180, 5190.

B. Statistics 5050-60-70 and 3 hours of applied psychometrics.

C. Eighteen hours of additional course work to be selected primarily from among the 5000-level course offerings in management and psychology (e.g., Management 5110, 5220, 5230).

D. Nine hours of Psychology or Management 5000 (Master's Thesis).

II. Program Requirements

A. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 630 or the 85th percentile on the GRE Advanced Test in Psychology.

B. To Ph.D. requirements described below in sections II A and II G comprise the major requirements for a Master's degree. An oral examination covering the thesis and related topics must also be completed.

THE DOCTORAL PROGRAM

I. Course Requirements (Currently under review and subject to change for Fall 1982 entrants)

A. Minimum course requirements:

1. Management or Psychology 5170, 5180, 5190.


3. Minimum of three 6000-level seminars to be selected from Psychology or Management 5220, 5260, and Management or Psychology 6380.

4. 36 hours of Psychology or Management 6000.

B. Recommended electives:

1. For preparation for advanced section

2. GRE: Psychology courses as appropriate.

3. For students who require preparation in psychometrics: Applied psychometrics.

4. For students who wish to pursue special research interests aside from their dissertation: Management 5250, 5260, Management or Psychology 6980.

5. Courses available in areas related to industrial and organizational psychology:

a. Through College of Business Administration

b. Through College of Liberal Arts;

c. Others as approved by advisor.

II. Program Requirements**

A. Attainment of B average*** in Management or Psychology 5170, 5180, 5190.

B. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 650 or the 85th percentile on the GRE Advanced Test in Psychology.

C. Completion of a comprehensive examination in scientific methodology before beginning the third year of study. This examination covers the following specific areas: statistics, psychometrics, experimental design.

D. Completion of a special comprehensive examination in the area of the student's major research and professional interest. A student is expected to take this examination by the end of twelve quarters. This examination may be repeated once, normally no later than six months after the second attempt, at the discretion of the student's doctoral committee.

E. By the end of nine quarters a student is expected to choose a major advisor (Chairperson of Doctoral Committee).

*May be repeated for additional credit.

**Any student in the doctoral program may be required to prepare a Master's thesis by the industrial and organizational psychology committee. This policy will be implemented by the committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.

***See program handbook for definition of a B average.
Life Sciences

Coordinating Council:

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 graduate program in Life Sciences supports study and research in the following concentrations: animal physiology, cellular and molecular biology, environmental toxicology, ethology, plant physiology/biochemistry, and reproductive and developmental biology. Students interested in any of these areas should contact the chairperson of Life Sciences or the director of the area of interest. Each concentration area is overseen by a committee and may have unique admission and graduation requirements above the minimums for the overall program.

GENERAL ADMISSION REQUIREMENTS

1. A Bachelor's degree with a major in a biological, behavioral or physical science.
2. GRE (aptitude) scores.
3. Three letters of recommendation.
4. Course work including a year of calculus (differential and integral), one year of chemistry, and one year of physics. Specific course deficiencies may be corrected during the first year.

GENERAL PROGRAM REQUIREMENTS

The program requirements are in general the same as those of The Graduate School. The Master's program requires 45 hours of study approved by the student's committee, a thesis, and a comprehensive oral examination. The minimum requirements for the doctoral program include at least 9 hours above the 6000 level, 36 hours of course work above 3000, a pattern of courses approved by the student's committee, a comprehensive examination, a doctoral dissertation, and a final examination. Individual concentration areas may have additional requirements.

AREAS OF CONCENTRATION

Animal Physiology: The inter-departmental program in physiology includes research in the areas of regulatory, reproductive, cooperative, exercise, cellular, developmental, muscle, or neuro-physiology.

Cellular and Molecular Biology: The inter-departmental program in cellular and molecular biology includes research in structural and functional aspects of cells or subcellular components, or the interactions between cells.

Environmental Toxicology: The toxicology program provides intensive training in basic toxicological principles and techniques. Courses and research expose trainees to mechanisms of intended and unintended interactions between living systems and potentially toxic agents from the point of view of biochemistry, physiology, ecology, public health, environmental law and regulation, pest management, pollution control and repair, and testing and residue analysis of toxicants.

Ethology: Ethology is the naturalistic 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.

Plant Physiology/Biochemistry: This program provides the opportunity for intensive training and research experience in areas transcending the usual boundaries of botany, biochemistry, and agricultural plant sciences. It devotes itself to seeking solutions of problems concerning the interactions of energy and agriculture, primarily at the biochemical and physiological level.

Reproductive and Developmental Biology: The inter-departmental program includes research in animal and plant development, reproductive endocrinology and control of reproductive function, gene regulation and cellular interactions in development.

Management Science

DEGREE

Management Science

Committee:
- R. S. Garfinkel (Chairperson); Management Science: R. W. Boling, Management; J. S. Bradley, Mathematics; E. Glustoff, Economics; J. K. Ho, Management Science; W. J. Morse, Accounting; R. E. Rosenthal, Management Science; R. E. Strieven, Finance; C. C. Thigpen, Statistics; M. G. Thomason, Computer Science; C. R. Woolam, Management.

THE MASTER'S PROGRAM

The M.S. program in Management Science is designed as preparation for a career in the application of quantitative techniques for the solution of management problems in large organizations. 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.

Applications are encouraged from all majors, but mathematics background equivalent to the completion of at least two years of college calculus and proficiency in a computer language (e.g. Computer Science 3150) is required. The program is designed to be completed in one calendar year by full-time students entering in the fall quarter. However, students may start the program in any quarter and may pursue an M.S. degree in Management Science on a part-time basis.

Course Requirements

Quarter Hours

Management Science 5310-20-30-35-40 14
Applied concentration area (approved by advisor) 12
Statistics 5110 3
Statistics elective (5000 level or above) 3
Mathematics (4000 level or above) 6
Electives selected from mathematics, statistics, computer science, and/or management science 6
Electives in any area approved by advisor 6
Total 50

A thesis option is available which substitutes 9 hours of thesis credit for the following 14 hours of course work: Management Science 5335-40, and one 3-hour course in the applied concentration area and 6 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 quarter and must approve all courses on a quarter-by-quarter 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 50 hours for all non-thesis students and 45 hours for all thesis students; however, the number of hours of electives can be reasonably expected to vary between 6 and 18 as a function of prior background.

For course listings and description of the Ph.D program in Management Science, refer to p. 42.
FOREIGN STUDY COURSES

Foreign study courses offered in some departments of the College provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

OFF-CAMPUS STUDY

Recognizing that learning is not restricted to formal classroom situations, the College provides for students to earn credit toward graduation for approved off-campus study. Such study may be undertaken only with prior approval of the faculty member and the department concerned. It may include certain kinds of work experiences, community involvement, working in political campaigns, etc. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

INDEPENDENT STUDY

Certain educational goals may best be met through independent study done by an individual under the direction of a faculty member. Students who wish to do such independent work should obtain the approval of the faculty members and the departments concerned prior to embarking upon their study. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

DEPARTMENTS OF INSTRUCTION

Anthropology

MAJOR

DEGREES

Anthropology

M.A., Ph.D.

Professors:

W. M. Bass (Head), Ph.D. Pennsylvania; C. H. Faulkner, Ph.D. Indiana; A. K. Guthe, Ph.D. Michigan; R. L. Jantz, Ph.D. Kansas; P. W. Parmalee, Ph.D. Texas A & M.

Associate Professors:

J. E. Harrison, Ph.D. Syracuse; M. H. Logan, Ph.D. Pennsylvania State; F. H. Smith, Ph.D. Michigan.

Assistant Professors:


The Department of Anthropology offers the Master of Arts and the Doctor of Philosophy degrees with concentrations in physical anthropology, cultural anthropology, archaeology, zooarchaeology, and folk culture.

THE MASTER'S PROGRAM

The formal requirements for the Master's degree include:

1. A minimum of three quarters of residence at The University of Tennessee, Knoxville.

2. A minimum of 45 quarter hours for graduate credit, including preparation of thesis. Thirty-six of these 45 hours must be in anthropology. 9 hours may be taken in closely related disciplines (at least one-half of the courses must be at the 5000 level).

FOREIGN STUDY COURSES

Foreign study courses offered in some departments of the College provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

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DEPARTMENTS OF INSTRUCTION

Anthropology

MAJOR

DEGREES

Anthropology

M.A., Ph.D.

Professors:

W. M. Bass (Head), Ph.D. Pennsylvania; C. H. Faulkner, Ph.D. Indiana; A. K. Guthe, Ph.D. Michigan; R. L. Jantz, Ph.D. Kansas; P. W. Parmalee, Ph.D. Texas A & M.

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THE MASTER'S PROGRAM

The formal requirements for the Master's degree include:

1. A minimum of three quarters of residence at The University of Tennessee, Knoxville.

2. A minimum of 45 quarter hours for graduate credit, including preparation of thesis. Thirty-six of these 45 hours must be in anthropology. 9 hours may be taken in closely related disciplines (at least one-half of the courses must be at the 5000 level).

FOREIGN STUDY COURSES

Foreign study courses offered in some departments of the College provide an opportunity to undertake independent study outside the United States. Prior to departure the student must have a plan of study approved by the department head and a supervising faculty member of the department concerned. Credit will be given only upon fulfilling all requirements set by the department and may vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

OFF-CAMPUS STUDY

Recognizing that learning is not restricted to formal classroom situations, the College provides for students to earn credit toward graduation for approved off-campus study. Such study may be undertaken only with prior approval of the faculty member and the department concerned. It may include certain kinds of work experiences, community involvement, working in political campaigns, etc. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

INDEPENDENT STUDY

Certain educational goals may best be met through independent study done by an individual under the direction of a faculty member. Students who wish to do such independent work should obtain the approval of the faculty members and the departments concerned prior to embarking upon their study. Credit per quarter will vary from 1-12 hours. The maximum credit which may be applied toward a degree in the College is established in each individual case by the department in which the student is working.

3530 Peoples and Cultures of Africa (3) Ethnographic survey of the aboriginal cultures of sub-Saharan Africa. Cultural diversity and human ecology in area perspective. Recommended prereq: 2530.

3540 North American Indian (3) An ethnographic survey of cultures of Arctic, Southwest, Plains and Eastern Areas. Emphasis on cultural differences of peoples occupying these areas during precolonial period. Recommended prereq: 2530. F or Sp

3555 Cherokee Ethnohistory (3) Survey of sociopolitical aspects of internal affairs and external relationships from first European contact to present. Emphasis on eighteenth and nineteenth centuries.

3575 Afro-American Anthropology (3) Anthropological perspectives on Blacks in New World: examination of Afro-Americans via anthropological theories and methodology.

3580 Peoples and Cultures of Mesoamerica (3) Ethnographic survey of aboriginal peoples and post-conquest changes in Indian cultures. Emphasis upon analysis of small rural communities using modern village studies as source material. Recommended prereq: 2530. A

3610 Archaeology of United States and Canada (3) Survey of prehistoric peoples north of Mexico from initial occupation to European contact. Recommended prereq: 2530. F

3620 European Prehistory I (3) Cultural development during Paleolithic, Mesolithic, and Neolithic. Recommended prereq: 2520, 2530. W, A

3630 European Prehistory II (3) Cultural developments during Metal Ages. From the close of Neolithic through Iron Age. Recommended prereq: 2530. 3620 and 3630 should be taken in sequence. W, A

3640 Ancient Civilization of Mesoamerica (3) Introduction to archaeology of areas of advanced Indian culture in Mexico and Central America beginning with earliest cultures and proceeding to contact with Europeans. Recommended prereq: 2520.

3660 Prehistory of Tennessee (3) History of archaeological research in Tennessee and survey of prehistoric American Indian cultures identified through research. Sp

3670 Principles of Archaeology (3) Research strategies in archaeological excavation, interpretation, and explanation. Prereq: 2520 or consent of instructor.

3700 Forms of Folklore (4) Introduction to the anthropological study of folklore.

3710 Survey of European Folk Cultures (3) Material and other aspects of folk life as expressed in beliefs, art, and folklore, under changing historical and social circumstances.

3800 Language and Culture (3) Relationship between linguistic categories and patterns of culture. Prereq: 2540 or consent of instructor. Recommended: 2530.

3811 Introduction to Museology (3) (Same as Art 3811.)

3900 Human Osteology (4) Intensive examination of the human skeleton. Prereq: 2510 and consent of instructor. 3 hrs and 1 lab. F


3930 The Biology of Races of Man (3) Processes of racial differentiation; criteria of significant differences among existing stocks; influence of biology and culture in race formation; analysis of studies concerning blood groups, race mixture, constitution growth and nutrition. Recommended prereq: 2510. Sp

3950 Human Identification (3) Introduction to techniques in identification of human skeletal material in forensic medicine. Sp; A

4200 Contemporary North American Indian (3) Survey of Indian cultures from initial Euro-American contact to present; emphasis on culture change, U.S. Government Indian policy, reservation life. Prereq: 2530 or consent of instructor. A

4210 Ethnographic Research Techniques (3) Methods of conducting ethnographic research, planning, and utilizing data. Prereq: Consent of instructor.

4240 Applied Cultural Anthropology (3) Applications of anthropological theory; methods and findings in programs of community and national development, public health, international aid, and military assistance. Examination of the roles of anthropologists, questionnaire construction, and analysis of scaled changes in applied programs. Intensive analysis of selected case studies. Prereq: 2630. A

4260 Medical Anthropology: Lecture (3) A survey of medical anthropology: emphasis on Western and non-Western cultural aspects of health, disease, treatment, death, and related concepts. Focus on analyses and descriptions of anthropological fieldwork. Sp

4259 Medical Anthropology: Laboratory (3) Fieldwork in medical anthropology. Emphasis on cultural aspects of health, disease, death, and health in industries, societies and folk medicine systems which coexist with Western, technical medicine. Coreq or prereq: 4250. A

4300 Readings in Anthropology (1-9) Intensive reading, problem oriented. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E

4340 Field Work in Archaeology (3-9) Practicum work surveying, excavating, processing, and analyzing of data. Prereq: 2510-2520 and consent of instructor. May be repeated. Maximum 9 hrs.

4380 Field Work in Physical Anthropology (3-9) Practicum work in prehistoric and ethnographic human biological data. May include either skeletal or living populations. Prereq: 2510-2520 and consent of instructor. May be repeated. Maximum 9 hrs.

4400 Cultural Ecology (3) Survey of concepts and methodological issues anthropologists encounter in cross-cultural studies. Cultural differences and their influence on human behavior. Prereq: 2530 or consent of instructor. A

4420 Dynamics of Culture (3) Culture change: innovation, diffusion and acculturation; cultural continuity and stability. Prereq: 2530 or consent of instructor. A

4430 Personality and Culture (3) Analysis of relation among individual, society and culture. Application of psychological techniques in cross-cultural studies. Prereq: 2520, 2530, 3410 or consent of instructor. A

4440 Urban Anthropology (3) Survey of theoretical and methodological issues anthropologists encounter researching cross-cultural urban settlements. Focus on anthropological perspective and urban problems and planning. Prereq: 3450 or consent of instructor. A

4480 Current Trends in Anthropology (3) Analytical integrative review in symposium of the current debates, research directions, theories, fieldwork methods, and general assumptions of the four subfields of anthropology: archaeology; physical anthropology, linguistics, and cultural anthropology. Sp

4490 Cross-Cultural Survey of Sex Roles and Behavior (3) Examination of sex roles and sex behavior from cross-cultural and diachronic viewpoints. Draws disparate and scattered studies together and attempts to arrive at generalizations as to how sex roles are learned, the parameters of acceptable sexual behavior and degrees of tolerance for sexual deviation in relation to social organization.

4500 Peoples of China II: Chinese Society After 1839 (3) Anthropological survey of Chinese society and culture in the period of revolution and rejection of the West, and development of modern, communist Chinese society and culture. Prereq: 2530 or consent of instructor. Recommended prereq: East Asian course.

4550 Indians of the Southeastern United States (3) Survey of Southeastern Indian cultures; emphasis upon aboriginal adjustment to environment; depiction of Southeastern Amerind groups prior to Euro-American contact. Prereq: 2530, 3540 or consent of instructor.

4560 Cherokee Ethnohistory (3) Intensive survey of ideology and material aspects of Cherokee culture existing at time of first European contact.

4570 Peoples of Southeast Asia (3) Survey of representative ethnic groups and indigenous cultures of mainland and island Southeast Asia. Problems of contemporary culture changes. Prereq: 2530, consent of instructor or an East Asian course.

4580 Asians In the Americas Since 1800: Anthropological Perspectives (3) Character, factors, and motivations in Asian immigration to North, Central and South America. Assimilation pattern and enclave communities are major topics. Major focus on United States.

4590 Peoples of Japan (3) Analysis of the culture diversity and unity of peoples of Japan. Prereq: 2530 or consent of instructor. Recommended: 3510 or an East Asian course.

4600 Method and Theory in American Archaeology (3) Historical development of New World archaeology with emphasis on theory and field techniques. Prereq: 2520 or consent of instructor. F

4610 African Prehistory (3) Survey of cultural history in Africa, south of the Sahara, from earliest evidence of human activity to time of European contact. Prereq: 2520 or consent of instructor. A

4640 Zoarchaeology (3) Basic osteological studies of vertebrate classes; emphasis on aboriginal human utilization of native animals in subsistence and culture. Identification, analysis, and interpretation of archaeologically derived molluscan and vertebrate remains. F

4650 Archaeology of Southeastern United States (3) Intensive study of prehistoric American Indian: Special emphasis on Tennessee prehistory. Prereq: 3610 or consent of instructor. W, A

4650 Prehistory of Northwest North America (3) Survey of Northwest prehistory. Prereq: 2510, 2520. Special emphasis on Western prehistory. Prereq: 2520 or consent of instructor. A

4670 Peoples of the Southwestern United States (3) Survey of prehistoric peoples north of Mexico from initial occupation to European contact; emphasis on culture change, U.S. Government Indian policy, reservation life. Prereq: 2530 or consent of instructor. A

4680 Field Work in Physical Anthropology (3-9) Practicum work surveying, excavating, processing, and analyzing of data. Prereq: 2510-2520 and consent of instructor. May be repeated. Maximum 9 hrs.

4730 and 4731 Practicum in Collection and Analysis of Human Biological Data (3) Practicum in the collection and analysis of human biological data. Prereq: 2530 or consent of instructor. A

4760 Italian Folklore (3) (Same as Romance Language 3700.) Perspectives on folklore of geographical regions and ethnic groups of the United States. Prereq: 3700 or consent of instructor.

4770 Southern Appalachian Folk Culture (4) Historical development of folk culture dealing with wide range of traditional culture in Southern Appalachia: settlement patterns, folk housing, economy, clothing, beliefs, speech, art, song, dance, and oral traditions and customs. Prereq: Consent of instructor. May be repeated.

4780 Mexican Folklore (3) Anthropological perspectives of folklore of geographical regions and ethnic groups of the United States. Prereq: 3700 or consent of instructor.


4790 Cherokee Language (3) (Same as Romance Language 4790.)

4790 Cherokee Language (3) Linguistic survey of structure of the Cherokee language.

4800 Physical Growth and Constitution (3) Comparative growth patterns throughout the human life cycle, skeletal and dental maturation, sex differences in growth; human constitutional types. Prereq: 2510 or consent of instructor. A
DEGREE REQUIREMENTS FOR M.F.A.

1. Successful completion of 30 hours of studio in concentration area. Inter-area studies must normally be approved by the faculty no later than the third quarter in residence. Fifteen hours of the major must be in second year courses.

2. Twelve hours of art history for graduate credit.

3. Seminar in Art History (4 hours) and Seminar in Art Criticism (4 hours)

4. Ten hours of electives which may consist of any committee-approved combination of graduate credit courses outside the student's departmental concentration.

5. First year evaluation: At the end of the first three quarters in residence the student must present work for evaluation by the faculty and receive permission to continue in the program.

6. Second year evaluation: With completion of all course work the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis (Art 5999).

7. Art 5999, Projects in Lieu of Thesis (30 hours) is a third year of semi-independent study.

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

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in Art History may be arranged with the consent of the student's committee, the instructors involved, and the Graduate School. Prerequisite is enrollment in the first year of the major sequence. The student must present work for the minor committee. May be repeated: Maximum 12 hrs.

Quarter Curriculum: hours
Thesis ........................................ 9
Area of concentration ........................ 12
Drawing and composition .................. 3
Art history ..................................... 9
Electives ...................................... 12
Total .......................................... 45
The thesis is a critical essay relevant to the area of concentration. The A.M. thesis may not be used to fulfill the project in lieu of thesis requirements for the M.F.A. A graduate exhibition is required. Final examination is oral.

MASTER OF ARTS

Areas of concentration consist of ceramics, communication design, drawing, fiber-fabrics, painting, printmaking, sculpture, and watercolor. One year of residence is required.

Quarter Curriculum: hours
Project in Lieu of Thesis .................. 30
Major sequence .............................. 30
Art history ................................... 12
Electives ..................................... 12
Seminar in Art Criticism .................. 4
Seminar in Art History ..................... 4
Total .......................................... 90

M. F. A. Rochester Institute of Technology;
W. E. Leland, M.F.A. Tennessee; F. Martinson, Ph.D. Chicago; F. Moffat, Ph.D. Chicago; D. Peacock, M.F.A. Iowa; F. C. Stewart, M.F.A. Claremont; S. Yates, M.F.A. North Carolina (Greensboro); R. P. Young, M.A. Columbia.

Assistant Professors:

Instructors:
F. Bahou, M.F.A. California (Los Angeles); L. Kocianski, M.F.A. California (Davis); T. Sauer, M.F.A. Wisconsin.

The Art Department offers two graduate degrees: Master of Arts and Master of Fine Arts. 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 equivalent proficiency.

4. A portfolio to be evaluated by the faculty. Application forms and further information are available by writing to the Department of Art.

MASTER OF ARTS

Areas of concentration consist of ceramics, communication design, drawing, fiber-fabrics, painting, printmaking, sculpture, and watercolor. One year of residence is required.

Quarter Curriculum: hours
Thesis ........................................ 9
Area of concentration ........................ 12
Drawing and composition .................. 3
Art history ..................................... 9
Electives ...................................... 12
Total .......................................... 45
The thesis is a critical essay relevant to the area of concentration. The A.M. thesis may not be used to fulfill the project in lieu of thesis requirements for the M.F.A. A graduate exhibition is required. Final examination is oral.

MASTER OF FINE ARTS

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

Six quarters beyond the baccalaureate degree are required in residence. Residence is defined by the Department of Art as (1) a minimum enrollment of 6 hours per quarter, and (2) use of Department of Art facilities so that students are available for discussion and criticism. Final examinations are oral, concurrent with project exhibition.

Quarter Curriculum: hours
Project in Lieu of Thesis .................. 30
Major sequence .............................. 30
Art history ................................... 12
Electives ..................................... 12
Seminar in Art Criticism .................. 4
Seminar in Art History ..................... 4
Total .......................................... 90

DEGREE REQUIREMENTS FOR M.F.A.

1. Successful completion of 30 hours of studio in concentration area. Inter-area studies must normally be approved by the faculty no later than the third quarter in residence. Fifteen hours of the major must be in second year courses.

2. Twelve hours of art history for graduate credit.

3. Seminar in Art History (4 hours) and Seminar in Art Criticism (4 hours)

4. Ten hours of electives which may consist of any committee-approved combination of graduate credit courses outside the student's departmental concentration.

5. First year evaluation: At the end of the first three quarters in residence the student must present work for evaluation by the faculty and receive permission to continue in the program.

6. Second year evaluation: With completion of all course work the student must present work for evaluation by the faculty and receive permission to register for Projects in Lieu of Thesis (Art 5999).

7. Art 5999, Projects in Lieu of Thesis (30 hours) is a third year of semi-independent study.

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

GRADUATE MINOR IN THE HISTORY OF ART

A graduate minor in Art History may be arranged with the consent of the student's committee, the instructors involved, and The Graduate School. Prerequisite is enrollment in the first year of the major sequence. The student must present work for the minor committee. May be repeated: Maximum 12 hrs.

3516 Typography (Th) Theories and techniques of typesetting and printing as fine art medium. Creative expressions may be repeated. Maximum 12 hrs.

3517 Airbrush (Th) Technique of airbrush. Emphasis on skill and creative applications. For art majors only. F, Sp

3704 Medieval Art (4) Byzantine and western art of Middle Ages: illumination, mosaics, Romanesque pilgrimage church, Gothic cathedral. F

3705 Northern European Painting: 1350-1600 (4) From courtly art of late Middle Ages to Northern Renaissance. Van Eyck, Roger van der Weyden, Bosch, and Durer: early printmakers. A

3715 Early Italian Renaissance Art: 1300-1500 (4) Development and exploration of naturalism. Revival of antiquity and development of theories of perspectivity in Early Renaissance. Duccio, Giotto, Masaccio, Donatello, Botticelli, A

3716 The Art of Italy, 1475-1575 (4) Leonardo da Vinci, Michelangelo, Titian, Raphael, Pontormo and Giorgione. F

3726 The Art of Northern Europe 1550-1675 (4) Tintoretto, El Greco, Caravaggio, Zurbaran, Velazquez, Bernini and Goya. Artistic relations between Iberia and Latin America. Sp

3735 History of Nineteenth-century Painting in Europe and America (4) Emphasis on France; Courbet, Impressionism, Manet, Cézanne, Seurat, Sisley, Degas, Whistler, and Degas. F

3736 History of Twentieth-century Painting in Europe and America (4) Fauvism, Die Brucke, Cubism, Der Blaue Reiter, Futurism, Dada and Surrealism, geometric abstraction, social commentary painting, Abstract Expressionism in the U.S.A. and parallels in Europe, Pop, Op, Minimal, and Concept Art. W


3764 History of Modern Sculpture in Europe and America (4) From 1800 to 1900. Neoclassicism to Rodin. From 1900 to present. emphasis on Cubism, Constructivism, Expressionism, Assemblage, Pop, Primary Forms, Environments, and Earthworks. Sp

3765 History of North American Art (4) Survey of landmarks in painting, architecture, sculpture, and design from prehistory to 1900. F

3766 History of Twentieth-century American Art (4) Analysis of developments in architecture, painting, sculpture, and design from 1900. W

3775 Art of Indian Asia (4) History of Indian art with consideration of art of Central Asia and Southeast Asia. Sp

3776 Chinese Art (4) F

3777 Japanese Art (4) F

3811 Introduction to Museology (3) Concepts, practices and historical development of museums of art, archaeology, anthropology and science. (Same as Anthropology 3811.)


4006 Special Topics (2-4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4015 Individual Problems (4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4106 Special Topics in Drawing (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4115 Drawing IV (4) Individualized pursuit of personal drawing techniques and concepts; individual and group critiques; weekly life drawing sessions. Prereq: 12 hrs 3115. May be repeated. Maximum 12 hrs. E

4119 Advanced Design Studio (4) To explore strengths, structural variability and form potentials of design materials, aesthetic potential. Prereq: Senior or graduate standing or consent of instructor.

4206 Special Topics in Painting (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4215 Painting IV (4) Individual concepts of personal expression with varied media on canvas. Prereq: 12 hrs 3215 for art majors; consent of instructor for non-majors. May be repeated. Maximum 12 hrs. E

4256 Special Topics in Fiber and Fabrics (4) Student- or instructor-initiated course to be offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.


4315 Watercolor IV (4) Individual concepts of personal expression with varied water-based media in paper. Prereq: 12 hrs 3315 for art majors; consent of instructor for nonmajors. May be repeated. Maximum 12 hrs. E

4406 Special Topics in Sculpture (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4415 Sculpture IV (4) Individual development of sculptural problems and techniques. May be repeated. Maximum 12 hrs. E

4470 Wood Design: Advanced Practical Construction (4) Application of laminations, carving and jointing techniques in designing and construction of contemporary furniture. Prereq: 2450 or consent of instructor. May be repeated. Maximum 12 hrs.

4506 Special Topics in Communication Design (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.


4516 Portfolio and Exhibition Techniques (4) Application of design principles to promotion, composition, display and evaluation for two- and three-dimensional artists. Prereq: Senior or graduate standing or consent of instructor. S

4545 Visual Communications Seminar (2) Political, social, economic and ethical problems of contemporary designer. Sessions with outside guest speakers and field trips. Prereq: 4515. W

4606 Special Topics in Printmaking (4) Student or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.

4615 Intaglio IV (4) Photographic, collage techniques, combine printing with other print media. May be repeated. Maximum 12 hrs. F, W, Sp


4617 Screen Printing (4) Traditional hand cut and photographic stencils; combine printing on paper and other surfaces. May be repeated. Maximum 12 hrs. F, W, Sp

4656 Special Topics in Metal Design (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.


4855 Studies in Art History (2) Concentration in the field of American or European art history. May be repeated. Maximum 16 hrs.

4956 Special Topics in Ceramics (4) Student- or instructor-initiated course offered at convenience of department. Prereq: Determined by department. May be repeated. Maximum 16 hrs.


4970 Glaze Calculation (4) Prereq: Senior or graduate standing and consent of instructor. W

4971 Kiln Construction (4) Prereq: Senior or graduate standing and consent of instructor. Sp

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May not be repeated. S/NC only. E

5011-21-31 Exhibition in Lieu of Thesis (3, 3, 3) 5101 Foreign Study (1-12) See page 97.

5102 Off-campus Study (1-12) See page 97.

5103 Independent Study (1-12) See page 97.

5115 Graduate Drawing I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5125 Graduate Drawing II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5215 Graduate Painting I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5225 Graduate Painting II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5255 Graduate Fiber and Fabrics I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5275 Graduate Fiber and Fabrics II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5315 Graduate Watercolor I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5325 Graduate Watercolor II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5415 Graduate Sculpture I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5425 Graduate Sculpture II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5515 Graduate Communication Design I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5525 Graduate Communication Design II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5615 Graduate Printmaking-Lithography I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5616 Graduate Printmaking-Intaglio I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5617 Graduate Printmaking-Screen Printing I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5625 Graduate Printmaking-Lithography II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5626 Graduate Printmaking-Intaglio II (2-6) Individual problems with etching and engraving. May be repeated. Maximum 18 hrs. F, W, Sp

5627 Graduate Printmaking-Screen Printing II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5795 Reading and Research in Art History (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5770 Seminar in Art History (4) A

5900 Seminar in Art Criticism (4) Theory and practice. Intended for majors in studio art. A

5955 Graduate Ceramics I (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

*5975 Graduate Ceramics II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp

5999 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by the graduate faculty. May be repeated. Maximum 30 hrs. E

*Graduate II courses must be preceded by successful first year evaluation by the faculty.

Courses offered periodically only at the Pi Beta Phi Arrowmont School of Crafts, Gatlinburg, Tennessee. Courses may be repeated.

4004 Special Topics (1-4) Student- or instructor-initiated course offered at convenience of department. May be repeated.

4104 Drawing (1-4) Intermediate to advanced.

4204 Painting (1-4) Intermediate to advanced.

4254 Fiber Processes (1-4) Intermediate to advanced.

4264 Fiber Construction (1-4) Intermediate to advanced.

4274 Fabric Surface Design (1-4) Intermediate to advanced.

4284 Fabric Constructions (1-4) Intermediate to advanced.

4304 Watercolor (1-4) Intermediate to advanced.

4404 Sculpture (1-4) Intermediate to advanced.

4504 Communication Design (1-4) Intermediate to advanced.

4604 Printmaking (1-4) Intermediate to advanced.

4654 Metal Design (1-4) Intermediate to advanced.

4664 Enameling (1-4) Intermediate to advanced.

4904 Photography (1-4) Intermediate to advanced.

4954 Ceramics (1-4) Intermediate to advanced.

Audiology and Speech Pathology

MAJORS

DEGREES

Audiology

M.A.

Ph.D.

Speech and Hearing Science

M.A.

Ph.D.

Speech Pathology

MA

Ph.D.

Audiology

A

Ph.D.

Audiology and Speech Pathology

A

Ph.D.

Professors:

H. L. Luper (Head), Ph.D. Ohio State; S. Adler, Ph.D. Ohio State; C. W. Asp, Ph.D. Ohio State; P. G. Carly, Ph.D. Iowa; D. M. Lipscomb, Ph.D. Washington; J. Nabieisk, Sc.D. Prague; H. A. Peterson, Ph.D. Illinois; B. Silverstein, Ph.D. Purdue

Associate Professors:

S. B. Burchfield, Ph.D. Michigan State; C. G. Malser, M.Ed. Texas.

Assistant Professors:

A. G. Diefendorf, Ph.D. Washington; E. Hamby, Ph.D. Iowa; C. J. Ferrall, 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 intent of each major program is to provide the student with the scholarly and professional skills necessary for functioning as an independent professional clinician in any clinical environment. Within this broad coverage of speech pathology or audiology, it is possible for a student to specialize to some extent. For example, in the M.A. in Audiology program, a student may emphasize audiological assessment, aural habilitation-rehabilitation, medical or pediatric, or industrial audiology. Within the M.A. in the Speech Pathology program, a student may emphasize language disorders, cultural language differences, or speech disorders such as aphasia or stuttering. Students interested in specializing beyond the typical broad M.A. program should consult the department office or their advisor for lists of suggested courses, practica and independent studies.

Students majoring in the two areas are expected to complete the academic requirements for clinical certification from the American Speech and Hearing Association, including the required number of clock hours of clinical practicum. An exception to this rule must be approved by the Department Curriculum Committee. Enrollment in clinical...
practicum courses are required for all clinical practice experiences. 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 program or the non-thesis option. Students in both programs are required to take 5110 and 5120. The Master's program culminating in the doctoral dissertation will include a minimum of 45 quarter hours of approved graduate credit, including 9 quarter hours of 5000 credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least one-half of these total courses must be at the 5000 or 6000 level, no more than 9 hours of which may be thesis courses. Students in the non-thesis option program must present a total of 48 quarter hours of approved graduate credit and pass a final written examination. A minimum of 24 quarter hours must be at the 5000 or 6000 level. The decision as to choice of the thesis or non-thesis program is normally made following completion of 5110 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 field of speech and language pathology, audiology, or speech and 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 master the accumulated knowledge in the area 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 to investigate problems pertaining to speech and language processes; the second year to conduct independent research; the third year to investigate problems pertaining to related disciplines providing insight into human communication processes; 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 degree of 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 9 quarter hours of graduate credit obtained in 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 specialization to give a broad foundation and understanding.
4. A comprehensive examination to demonstrate a general knowledge of the basics of audiology, speech and language pathology, and speech and hearing science; advanced knowledge of the specifics of the area of specialization.
5. Research and dissertation to give at least 36 hours of graduate credit (6000 level).
6. A final oral examination.

4040 Apraisal of Speech and Language Disorders (4) Diagnostic procedures for children and adults with speech and language problems including observation and practice with diagnostic tests. Prereq: 3040, 3050, or consent of instructor. (Same as Special Education 4040) F, Sp

4070 Free Association (4) Oral and written free association as process for diagnosing and treating communication disorders. Includes didactic self-analysis. W

4190 Speech Development of the Hearing Impaired (3) (Same as Special Education 4190)

4200 Practicum in Speech Development of the Hearing Impaired (3) (Same as Special Education 4200)

4210-20 Language Development of the Hearing Impaired I, II (3, 3) (Same as Special Education 4210-20)

4250 Introduction to the Psychology and Education of the Hearing Impaired (3) (Same as Special Education 4250)

4310 Stuttering (3) Nature and treatment. Review and integration of various theories. Prereq: 3040 or consent of instructor. (Same as Special Education 4310). F, Su

4320 Introduction to Clinical Practice in Speech Pathology (3) Prereq: 3040, 3050, 3310, 4040, and consent of instructor. (Same as Special Education 4320) S/N only.

4330 Clinical Practice in Speech Pathology (1-6) Prereq: 4320 and consent of instructor. (Same as Special Education 4330) S/N only.

4340 Clinical Practice in Speech Pathology (1-6) Prereq: 4330 and consent of instructor. (Same as Special Education 4340). May be repeated. S/N only.

4400 Voice Disorders (4) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 10, 3065, or consent of instructor. (Same as Special Education 4400)

4450 Clinical Practice in Audiology (1-6) Prereq: 4720 and 4930.

4600 Clinical Practice in Audiology (1-6) Prereq: 4450, 4720 and 4930.

4700 Clinical Practice in Audiology (1-6) Prereq: 4460, 4720, 4930. May be repeated. Maximum 9 hrs. E

4520 Speech Pathology (3) Independent study of special problems in speech pathology. Prereq: Consent of instructor.

4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor.

4560 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E


4620 Birth Defect Syndromes and Language Retardation (3) Examination of research literature relevant to birth defects and language retardation including clinical, educational and socioemotional implications of such disorders. Prereq: 4610 or consent of instructor. F

4630 Practical Applications of Language Habilitation Techniques (3) Discussion and demonstration of various methods and procedures used in treating language retarded children. Prereq: 4610 or consent of instructor. W

4640 Parent Participation in Language Habilitation (3) Nature of counseling and educational relationships with parents of exceptional children including emotional support for families, behavior management strategies, home training methods. Prereq: 4610 or consent of instructor. Sp

4650 Speech and Language of the Culturally Different Child (3) Discussion of speech and language differences of children of various minority groups, of different ethnic and class membership and from different geographic regions; their causes, and their effects upon educational programs. F, W, Su

4680 Topics in Language Retardation and its Habilitation (3) Lectures on selected topics by representatives of such fields as special education, early childhood education, educational psychology, genetics, and psychology. Prereq: 4610 or consent of instructor. Su

4720 Audiology II (4) Basic principles of clinical audiology, hearing screening, interpretation and presentation of special auditory tests. Prereq: 3710. (Same as Special Education 4720) W, Su


4930 Aural Rehabilitation: Speechreading and Auditory Training (2) Rehabilitation of acoustically impaired by maximizing use of residual hearing and utilizing speechreading as receptive communicative process. Prereq: 4720. (Same as Special Education 4930) F, W, Su

4940 Introduction to the Verbo-Tonal System (4) Prereq: 3710 or 4700. Recommended prerequisite 4930 and 3050. (Same as Special Education 4940) F, W, Su

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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.

5040 Advanced Clinical Practice in Audiology Study and Practice (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 12 hrs. (Same as Special Education 5040) E

5054 Practicum in Hearing Aid Orientation and Communication Counseling (1-8) Practical exposure to counseling hard of hearing and family members concerning use and expectations of hearing aids, suggestions for better use of communication skills. Prereq: 4720, 4930, and consent of instructor. May be repeated. Maximum 8 hrs. E

5059 Practicum in Verbo-Tonal Habilitation (1-6) Prereq: 4940, 5950, or consent of instructor. May be repeated. Maximum 12 hrs. E

5051 Practicum in Aural Rehabilitation (1-6) Prereq: 4720 and 4830. May be repeated. Maximum 9 hrs. E

5060 Anatomy and Physiology of Speech (3) Structure and function of neuromuscular system involved in speech and language, phonation, resonance, and articulation. Prereq: 3065. F, W

5070 Anatomy and Physiology of Hearing (3) Structure of human ear, pathology of hearing impairment, and psychoacoustics of audition. Prereq: 3710. F
5071 Physiological Acoustics and Audiology (3) Techniques for electrophysiological measurement of auditory sensitivity, sound transmission by ear, distortion in ear, and ear as analytic mechanism. Prereq: 4720, 5070 or consent of instructor. Sp.

5100 Comparative Anatomy of the Peripheral Auditory Structures (3) Tutorial laboratory course in comparative anatomy of temporal bone employing microscopic dissection techniques. Prereq: 5070 or consent of instructor. E.

5110 Introduction to Research in Speech and Hearing (3) Laboratory techniques in the application of statistics, and completion of pilot research project. Prereq: Elementary statistics. F, W, Su.


5119 Laboratory in Instrumentation in Audiology and Speech Pathology (1) Laboratory assignments designed to familiarize student with instruments for measuring speech and hearing processes. Prereq: 5117. E.

5200 Seminar on Stuttering (3) Current significant research in problem of stuttering. Prereq: 4310 or consent of instructor. W, Su.

5201 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: 5060 or equivalent or consent of instructor. W, Su.

5220 Seminar: Articulation Disorders (3) Current significant research in theory and management of articulation disorders. Prereq: Undergraduate course in articulation disorders or consent of instructor. F, Su.


5320-36-40 Advanced Clinical Practice in Speech and Language Disorders (1-6) Prereq: 4340 or equivalent and consent of instructor. 5340 may be repeated. Maximum 9 hrs. S/N Only: E.

5350-60-70 Advanced Clinical Practice in Speech Diagnosis (1-6, 1-6, 1-6) Prereq: 4340, 4340 or equivalent and consent of instructor. 5370 may be repeated. Maximum 9 hrs. S/N Only: E.

5380 Cerebral Palsy (3) Neurological foundations and speech and language training. Prereq: 5060. (Same as Speech Education 5380.) F.

5381 Adult Dysarthria (3) Neuroromotor organization for speech production; types of adult dysarthria and associated neuromuscular symptomatology; diagnosis and management of adult dysarthric speakers. Prereq: 5060. Su.

5390 Cleft Palate (3) Etiology, diagnosis and clinical management of cleft palate speakers, emphasis on speech. Prereq: 3310. (Same as Speech Education 5390.) W, Su.

5440 Hearing Aid Evaluation (3) Procedures in assessing benefits of amplification of sound for speech production; types of adult dysarthria and associated neuromuscular symptomatology; diagnosis and management of adult dysarthric speakers. Prereq: 5060. Su.

5440 Sound Measurement and Audiometer Calibration (3) Noise measuring systems and techniques; factors in military and industrial audiology, role of audiologist in industry. Prereq: Basic Audiology or consent of instructor. W.

5451 Noise and Audiology (3) Audiologist's role in noise-related activity, clinical, legal and consulting applications. Prereq: 5450 or consent of instructor.

5460 Advanced Audiology (3) Theory and practice of advanced pure tone and speech audiometry; instrumentation and interpretation of audiometric findings with differential diagnosis. Prereq: 4720. F.

5470 Impedance Measurement in Audiology (2) Theoretical considerations behind emergence of impedance measurement in clinical measurement of hearing. Practical experience in using several impedance measuring devices. Prereq: 4720 and 5070. W.

5490 Practicum in Hearing Conservation (1-6) Supervised on-site experience in hearing conservation programs at industrial settings. Prereq: 5040. May be repeated. Maximum 6 hrs. E.


5503 Special Auditory Tests (3) Theoretical and practical considerations of audiological procedures used for differentiating between cochlear vs. retrocochlear auditory lesions. Identifying central auditory lesions and nonorganic hearing loss. Prereq: 5490.

5505 Special Problems in Audiology (1-6) Prereq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. E.

5520 Seminar in Speech Pathology (3) Current significant research in speech pathology. Topics vary from quarter to quarter. Prereq: 12 hrs in speech pathology may be repeated with consent of department. Maximum 12 hrs. E.

5540 Seminar in Language Pathology (3) Nature, etiology, therapy, and management of delayed language development in children. Prereq: 4610 (Same as Special Education 5540.) W.

5550 Special Problems in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E.

5560 Independent Study in Speech Pathology (1-3) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E.

5570 Management and Supervision for Speech-Language Hearing Professionals (3) Management systems, accountability, personnel procedures used clinical supervision. For audiologists and speech language pathologists interested in private practice, supervision or administration. Prereq: 5440.

5600 Independent Study in Audiology (1-6) Special reading, consultation, and research activities in field of audiology. May be repeated. Maximum 6 hrs. E.


6000 Doctoral Research and Dissertation (3-5) E.

6010 Experimental Phonetics (3) Acoustical and physiological acoustics, speech production and perception. Prereq: 5119 or consent of instructor. F.

6019 Experimental Phonetics Laboratory (2) Must be taken concurrently with 6010.

6020 Psychoacoustics (3) Auditory reception and perception of nonspeech stimuli. Prereq: 6010. W.

6029 Psychacoustics Laboratory (2) Must be taken concurrently with 6020. W.


6270 Experimental Techniques in Cochlear Physi-ology and Neurophysiology (3) Prereq: 5070 or equivalent. W, A.

6360 Seminar in Speech Science (3) Advanced study of experimental areas such as speech physiology, acoustic analysis, recognition, perception and intelligibility of speech, communication theory, and psycholinguistic measurement of speech and language. Topics vary from quarter to quarter. Prereq: 6010 or consent of instructor. May be repeated. Maximum 9 hrs. Sp, W, A.

6110 Experimental Design in Speech and Hearing (3) Analysis of experimental design in theses and related journals. Psychophysical methods for data acquisition. Generation of experimental designs based on parametric and nonparametric statistics. Prereq: 5110 or equivalent and consent of instructor.

6117 Theories of Hearing (3) Physiological process basic to classical theories of hearing related to sensitivty, loudness, pitch, frequency discrimination, and intelligibility of speech stimuli. Prereq: 5070 or consent of instructor. F.

6119 Advanced Instrumentation in Speech and Hearing Science (3) Selection, use and calibration of instrumentation used in speech and hearing research. Prereq: 5117, 5119 or equivalent. Sp.

6500 Advanced Seminar in Speech Pathology (3) Prereq: Consent of instructor. May be repeated. Sp.

6520 Advanced Seminar in Speech and Language Disorders (3) Topics vary from quarter to quarter but include advanced study of alterations of voice, articulation, speech and language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated. E.

6540 Directed Research (1-6) Participation in on-going or non-dissertation research. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. E.

6570 Directed Study in Speech Pathology (1-3) May be repeated. Maximum 9 hrs. E.

6580 Directed Study in Audiology (1-3) May be repeated. Maximum 9 hrs. E.

6590 Directed Study in Speech Science (1-3) May be repeated. Maximum 9 hrs. E.
Biochemistry

MAJOR: Biochemistry

DEGREES
M.S., Ph.D.

Professors:
W. D. Wicks (Head), Ph.D. Harvard; J. E. Churchich, Ph.D. Sheffield (England); J. G. Joshi, Ph.D. Poona (India); K. J. Monty, Ph.D. Rochester

Assistant Professors:
L. Huang, Ph.D. Michigan State.

L. B. Drabstein, Ph.D. Illinois; R. Bryant, Ph.D. Illinois; R. H. Feinberg, Ph.D. California (Berkeley); J. W. Koontz, Ph.D. Kentucky.

The graduate program involves successful completion of a series of graduate courses and seminars and a qualifying examination at the end of the first year. In addition, the M.S. degree requires research leading to the writing and oral defense of a thesis, while the Ph.D. degree requires successful completion of a comprehensive examination and extensive research leading to the Ph.D. dissertation and its oral defense.

The qualifying examination: At the conclusion of the first year's work in 5510-20-30, 5310-20-30 and 4230, a comprehensive qualifying examination covering all of the material will be taken by all first year graduate students, without exception, in the first week of the summer quarter. On the basis of results of the examination, the student will be counseled concerning his/her future in the biochemistry program.

THE MASTER'S PROGRAM

This program requires about two years of full-time study and provides both breadth and depth of training by mixing classroom instruction with research laboratory experience. Students completing this program will have a sound foundation in modern biology and chemistry and will be equipped to follow and absorb future advances in these fields. Recent graduates of this program are now involved in such occupations as industrial pharmaceutical research, junior college and high school teaching, hospital laboratory work, cancer research, scientific journalism, and professional writing.

Candidates usually should offer course work covered by an undergraduate major in either biology or chemistry. Departmental requirements consist of the satisfactory completion of 45 credit hours of graduate work and the mastery of the subject matter of the following courses:

1. Introductory Organic Chemistry with laboratory (at least one year)*, at least one quarter of analytical chemistry, and a minimum of three quarters of approved physical chemistry.

2. A minimum of 12 quarter hours of approved biology courses beyond the Introductory level, including at least 3 hours of genetics and 3 hours of physiology.

3. Biochemistry 5510-20-30, 5310-20-30, 4230; and at least one special topics course (5430), or 5610 or 5110 or 5120 or 5130 or 5210.

4. A qualifying examination as described above.

5. At least 9 hours of advanced lecture-seminars selected from the following:
   Biochemistry 6410, 6010.

6. At least 9 hours of Master's research and a thesis.

7. A final comprehensive examination which will cover both the thesis endeavor and the subject matter of the course requirements.

THE DOCTORAL PROGRAM

An incoming student must present course work covered by an undergraduate major in either chemistry or biology. Departmental requirements for the awarding of the Ph.D. include mastery of the subject matter indicated in the following list of courses.

Course contents listed in items 1 and 3 are prerequisites to taking the comprehensive examination: applicants usually should expect to complete these requirements within the first two years of graduate school.

1. Introductory Organic Chemistry with laboratory (at least 1 year)*, at least one quarter of analytical chemistry, Chemistry 4510*, Introductory Physics*, Differential and Integral Calculus*; at least three quarters of approved graduate courses in chemistry or physics, for example: Chemistry 5110-20-30-35, Chemistry 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30; plus minimum of three quarters of approved physical chemistry (Biochemistry 4210-20-30, or Chemistry 4910-20 and Biochemistry 4230, or Chemistry 3410-20-30) and at least 18 hours of biology beyond the introductory level including at least 3 hours of genetics and 3 hours of physiology. At least 3 hours must be graduate credit in an approved area of specialization which should be identified early so that necessary prerequisites can be taken.


3. In addition to the courses listed in item 3 above, four courses selected from those numbered 5110 or higher, excluding 5300 or 5640.

4. Qualifying Examination.

5. Participation in Biochemistry 6410 and in the advanced biochemistry seminars 6010 during the entire period of residence.

6. Comprehensive Examination: Students who pass the comprehensive qualifying examination with sufficiently high marks and those who complete a mandatory M.S. degree (required prior to the comprehensive examination) will take the examination, at a time and of a format compatible with Graduate School requirements as determined by the student's committee.

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

8. A final examination which will be conducted primarily with the student's dissertation.

Petitioning for Master's degree: Students who have passed the preliminary examination in the Ph.D. program may petition the department for award of a Master's degree. The requirements for such a degree shall be:

a. The completion of at least 45 hours of approved course work for graduate credit, at least half of which must be at or above the 5000 level.

b. The preparation of a research manuscript suitable for submission for publication in a major scientific journal.

c. The 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.

4110-20 Cellular and Comparative Biochemistry (4, 4) Electolyte behavior; chemistry and structure of proteins, enzymes, nucleic acid and biological function; catabolism and energy capture; synthetic metabolism; nucleic acid function, protein synthesis and biochemical genetics; regulation of biological processes. Must be taken in sequence. Prereq: Chemistry 3211-21-31, 3219-29-39, and 1 course from Biology 1210-20-30 or Botany 1110-20. 3 lectures and discussion. F, W, Sp, W, Sp

4119 Cellular and Comparative Biochemistry Laboratory (2) Basic biochemical procedures of general application in biochemistry and molecular biology. Prereq or coreq: 4110. F, W, Sp

4210-20 Introduction to Physical Biochemistry (3, 3) 4210—Introduction to thermodynamics: phase stability and phase change; chemical potential; osmotic pressure; structure of proteins; metabolic systems in mitochondria and other cell organelles. Supramolecular organization, bioenergetics, transport phenomena, drug metabolism, oxygen toxicity and defense mechanisms, nitrogen fixation and photosynthesis. Emphasis on experimental approaches. Prereq: 4110 or equivalent. Open to undergraduates with consent of department.


5120 Biochemistry of Mitochondria and Selected Organelles (3) Oxidative phosphorylation and other metabolic systems in mitochondria and other cell organelles. Supramolecular organization, bioenergetics, transport phenomena, drug metabolism, oxygen toxicity and defense mechanisms, nitrogen fixation and photosynthesis. Emphasis on experimental approaches. Prereq: 4210 or 5610 or equivalent.

5130 Protein Structure and Enzyme Function (3) Biochemical and functional properties of proteins; primary, secondary, tertiary and quaternary structure; denaturation, renaturation and other conformational change; structure-function correlations; coenzyme-specific models of catalysis; allosteric regulation, and allosteric kinetics of catalysis. Prereq: 4110 and either 4420 or Chemistry 3430.

5210 Structure and Function of Biological Membranes (3) Structural organization of biological membrane components. Dynamic properties as studied biochemically and biophysically. Selective topics of membrane functions related to structural organization.

5220 Structures and Functions of the Nucleic Acids (3) Chemistry of nucleic acids; hydrogen bonding and double-stranded structures; coiling, supercoiling, and other higher order structural considerations; biosynthesis of DNAs and RNAs; repair

* Though completion of these courses or the equivalent is required, they may not be taken for graduate credit.
mechanisms; degrading mechanisms; mechanisms of genetic information storage and retrieval. Prereq: 4110-20 or equivalent.

5230 Protein Synthesis and its Role in Metabolic Regulation (3) Mechanism of assembly of peptide chains; ribosomes, structure and function; deciphering and genetic code; regulation of transcriptional and translational events (induction, repression, etc.). Prereq: 4110-20.

5300 Graduate Research Participation (3-9) May be repeated. Maximum 12 hrs.

5310-20-30 Experimental Techniques (2, 2, 3) Tutorial laboratory course in modern experimental methodology and instrumentation. Intended primarily for departmental majors. F, W, Sp

5450 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated.

5510 Properties of Biomolecules Related to Function (3) Structures, chemical and physical properties of biomolecules developed from theoretical and experimental points of view to explain actions and interactions. Prereq: Chemistry 3211-21-31, Chemistry 2140 recommended.

5520 Molecular Basis of Metabolism and its Regulation (3) Regulation of metabolic pathways depend on energy demands of organism and on synthesis of macromolecule precursors. Prereq: 5510 or consent of department. W

5530 Biosynthesis and Regulatory Functions of Intramolecular Molecules (3) DNA, RNA, and Proteins. Roles in replication, transcription, translation and metabolic regulation. Prereq: 5520. S

5510 Environmental Toxicology (3) Basic concepts in toxicology, interactions at subcellular, cellular, organ, organismal, population, and environmental levels, legal aspects. Major emphasis on biochemical toxicology. Prereq: 4110-20, Chemistry 3211-21-31, Chemistry 4190-20-30, or consent of instructor. (Same as Ecology 5610.) W

5840 Techniques in Environmental Toxicology (2) Survey of experimental techniques for assessment of presence, toxicity, and impacts of pollutants in global ecosystem. Laboratory exercises focus on analytical, biochemical, and bioassay methods employed in toxicological studies. Prereq: Chemistry 2140-2149 and 3211-21-31, 3219-29-39. (Same as Ecology 5640.) Sp

6000 Doctoral Research and Dissertation (3-15) E

6010 Advanced Biochemistry Seminar (1) Topics to be covered posted in spring quarter for following year. Must be repeated. Maximum 9 hrs. S/NC only. F, W, Sp

6410 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in field of chemical biology. May be repeated with consent of department. S/NC only. F, W, Sp

6420 Current Topics in Biological Membrane Research (1) Current literature on biological membrane research. Prereq: 4110-20 or equivalent. May be repeated. Maximum 9 hrs. S/NC only. (Same as Microbiology 6420). F, W, Sp

6431 Current Topics in Environmental Toxicology (1) Critical reviews of research problems and methods in environmental toxicology; behavioral toxicology, biochemistry and ecological effects, bio- statistics and epidemiology. Presentations by students, faculty and guest lecturers from academia and industry. May be repeated with consent of department. Maximum 6 hrs. (Same as Ecology 6431.) S/NC only. F, W, Sp

6450 Advanced Special Topics (1-3) Registration only by prior arrangement with department. For students who have passed Ph.D. preliminary examination or are in advanced state of graduate studies. Topics posted in advance. May be repeated. Maximum 9 hrs.

## Botany

### MAJOR

#### DEGREES

**Botany**

M.S., Ph.D.

**Professors:**


**Associate Professors:**

C. C. Amundsen, Ph.D. Colorado; J. D. Capoviti, Ph.D. Harvard; A. S. Heilman, Ph.D. Ohio State; R. R. Henkel, Ph.D. Miami (Ohio); L. G. Hickey, Ph.D. Massachusetts; K. W. Hughes, Ph.D. Utah; O. J. Schwartz, Ph.D. North Carolina State; H. H. Shugart, Ph.D. Georgia.

**Assistant Professors:**


The Department of Botany offers the Major of Science and Doctor of Philosophy degree with concentrations in anatomy, bryology, cytology, cytogenetics, ecology, genetics, lichenology, morphology, mycology, photobiology, physiology, phytology, spermatology, and taxonomy.

**Requirements for admission:** In addition to the general Graduate School requirements (see page 10) the botany department also strongly recommends submitting aptitude and advanced scores from the Graduate Record Examination, at least three letters of recommendation from academic or professional persons, a short statement describing probable areas of interest in botany, and the following specific courses:

1. general botany or biology, 12 quarter hours;
2. advanced botany or closely allied biological sciences, 18 quarter hours;
3. physical sciences; general inorganic chemistry, 12 quarter hours organic chemistry and physics highly recommended;
4. college mathematics, 9 quarter hours.

General degree requirements are given on pages 18-21. Special departmental requirements include successful completion of the following.

### THE MASTER'S PROGRAM

#### A. Thesis Program

1. Satisfactory preparation of a written formulation and oral defense to the student's committee of a research proposal suitable for a thesis problem. Must be completed before enrollment in Botany 5000.
2. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030 (can also be applied to the doctoral program).
3. Satisfactory completion of 2 credit hours at the 6000 level.
5. Presentation of a thirty-minute departmental seminar.
6. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

#### B. Non-Thesis Program

1. Satisfactory completion of 51 quarter

hours of approved graduate courses of which 30 quarter hours must be in botany including Botany 5003 and 5004.
2. Satisfactory completion of 2 credit hours at the 6000 level.
3. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.
4. Satisfactory performance on a final written examination on all work offered for the degree. The department may or may not follow this examination with an oral examination.

### THE DOCTORAL PROGRAM

1. Satisfactory presentation of a written formulation and oral defense to the student's committee of a research proposal suitable for a dissertation problem. Must be completed before enrollment in Botany 6000.
2. Satisfactory performance on a written comprehensive examination.
3. Presentation of one or more cognate areas outside of the department totaling 9 graduate credit hours with at least a B average.
4. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030.
5. Satisfactory completion of 9 credit hours at the 6000 level (excluding dissertation).
7. Presentation of a one-hour departmental seminar near the end of the doctoral program.
8. Educational service is required of each graduate degree candidate and such service will include teaching and/or ancillary services performed in the department related to the instruction of courses.

*Note: Graduate School requirements are denoted by an asterisk. These requirements should be interpreted as minimal requirements and specific stipulations or requirements such as additional foreign languages, additional oral preliminary examinations may be required by the individual student's faculty committee.*

**3010-20 Plants in Evolution (4, 4) Monera to angiospermae; emphasis on evolutionary relationships, morphology and development. Prereq: 6 hrs. in biological sciences. F, W

**3030 Field Botany (4) Study of plants in natural environments including plant identification, collection, preservation and basic ecological concepts. Prereq: 6 hrs. in biological sciences. F, W

**3031-32 Field Botany (4, 4) Emphasis on fall and winter flora respectively. Prereq: 3030. Need not be taken in sequence. W

**3050 Socioeconomic Impact of Plants (3) Significance of plants in origin and development of human cultures, evolution of cultivated plants, and role of plants in present civilizations. Occasional field trips. Sp, Su

**3070 Genetics and Society (3) An introduction to genetics, anthropology and evolution with emphasis on their implications for human society. (Same as Anthropology 3070). W, A

**3090 Biology and Human Affairs (3) Basic biological principles involved in deterioration and preservation of an environment in which human cultures may survive. F

**3210 Introductory Plant Physiology (4) Organismal physiology of plants; water relations, mineral nutrition, morphology and end products of metabolic pro-
cesses, effects of age, light, natural rhythms, temperature, and environmental factors. Lecture and lab. Prereq: 1 yr general chemistry and 1 yr biological science. F, Sp, Su

4017 Field Mycology (3) Field experience on identification of molds and liverworts. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4021 Field Bryology (3) Field experience on identification of mosses and liverworts. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4022 Field Lichenology (3) Field experience on identification of lichens. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4023 Field Agrostology (3) Field experience on identification of grasses. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4030 Mechanisms of Plant Speciation (3) Processes of plant speciation emphasizing population genetics and molecular techniques. Evolutionary radiation, populations, establishment of population barriers and other aspects of plant speciation. Prereq: 3010-20 and Biology 3110. W, A

4045 Aquatic Vascular Plants (3) Field experience on identification of aquatic vascular plants. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4050 Synanthrology (3) Field experience on identification of composite. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A


4061 Field Physiology (3) Field experience on identification of fresh water algae. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4075 Botanical Photography (3) Photography of natural history subjects and achievements. Use of camera; film selection; exposure. Visual presentations, establishment of photo facilities. Lecture and lab. 35 mm format. Limited shared equipment available. Students encouraged to use own equipment. Film and processing costs paid by student. Photos processed and critiqued in class. Prereq: 6 hrs of botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

4080 Field Pteridology (3) Field experience on identification of ferns and fern allies. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs of botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A


4240 Paleobotany (4) Same as Geology 4240.

4310 Plant Ecology (4) Interactions between individuals, species, communities and their environments. Circulation of energy and matter in ecosystems, population density and growth. Identification of field species and habitats; laboratory sessions and at least two weekend field trips. Prereq: 3030 or equivalent. F, Sp, A

4320 Field Measurements in Plant Ecology (3) Practice in use of field and laboratory instruments for measurement of environmental factors, plant functions, and/or community characteristics. Data collection, analysis and interpretation of data. Visits to highly instrumented field sites. Prereq: 3030 or equivalent; 1 year physics and chemistry recommended. Su

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree candidacy. May not be used toward degree requirements. May be repeated. S/NC only. E

5003-04 Non-Thesis Research (3) Library, field or laboratory research under supervision of staff members. Not for thesis candidates.

5011 Mycology (4) Intensive survey of fungi, including life history, utilizing lecture, laboratory and field information. Occasional field trips. Prereq: 3010, 3 hrs and 1 lab. Sp

5012 Morphology and Evolution of the Phycocyanocytes (4) Similar to 5090, but dealing with Phycocyanocetes. Prereq: 5011 or consent of instructor.

5021 Bryology (4) Taxonomy, phycology, ecology, physiology, and developmental morphology of bryophytes with emphasis on field studies and current trends. Prereq: 3010, 5011 or 4017. F, W, A

5022 Lichenology (4) Taxonomy, phycology, eco- nomics and symbiosis of lichens with emphasis on field studies and current research. Prereq: 3010, 5011 or 4017. Recommended prereq: 5061. 3 hrs and 3 labs. F, A

5031 Vascular Plant Taxonomy (4) Family characteristics of vascular plants, including principles of phycology and classification, based primarily on families of local flora. Prereq: 3030 or equivalent. 2 hrs and 2 labs. Sp

5051 Physiology (4) Intensive comparative study of major divisions of algae, both freshwater and marine. Taxonomical, ecological, morphological, developmental and phylogenetic aspects. Field and laboratory studies, identification and classification; introduction to ecological theories. Prereq: 3010 or consent of instructor. 2 hrs and 2 labs. Sp, A

5055 Phytoplankton Ecology (4) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, ecological theory applied to phytoplankton communities, and physiological adaptations by populations to environment. Prereq: 3010 or consent of instructor. F

5070 Principles of Biological Illustration (3) Principles and applications of black and white and pictorial or graphic form. 1 hr and 3 labs. W

5080 Pteridology (4) Evolutionary study of lower vascular plants: morphology, cytology, life cycles and classification. Biosystematic studies and recognition of local species. Prereq: 3020-30 or consent of instructor. 2 hrs and 2 labs or field trips. F, A

5090 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: 3010 or equivalent. F

5120 Agrostology (4) Collection, identification, classification, and phycology of tribes of grasses. Prereq: 3030 or consent of instructor. 2 hrs and 2 labs. F, A

5150 Advanced Morphology of Flowering Plants (4) Vegetative and reproductive organography; regulation of physiological processes and pollination mechanisms; embryology and deviations, seed and fruit development. Prereq: 3020-30 or 4120; 3210 or consent of instructor. F, W, A

5160 Biosystematics (4) Major experimental methods used in systematics and application to specific types of systematic problems. Cytotaxonomy, numerical taxonomy and chemotaxonomy. Prereq: Consent of instructor. F, A

5210 Advanced Plant Physiology I (3) Plant cell structure and function, carbon, nitrogen and sulfur assimilation, respiration and biosynthesis of specialized plant products such as terpenes, alkaloids and pigments. Prereq: Chemistry 3231. F

5220 Advanced Plant Physiology II (3) Photophysiology, response of plants to light: photochemistry, photosynthesis, and photophytochrome mediated responses. Water and solute uptake, loss, and movement; translocation; and fundamentals of mineral nutrition. Prereq: 5210 or Biochemistry 4120 and a cell physiology course. Recommended prereq: 1 yr of physics. W

5235 Advanced Plant Physiology III (3) Growth and differentiation of plants at molecular, cellular and organismic levels. Hormonal regulation of development; macromolecular interpretation of differentiation dormancy; germination; flowering; and senescence. Prereq: 5210 or Biochemistry 4120 and a plant cell physiology course. Recommended prereq: 5220. Sp

5240 Quaternary Problems (4) (Same as Geology 5290 and Zoology 5290.)

5310-20-30 Special Problems in Botany (1-5, 1-4, 1-6)

5340 Plant Geography (4) Distribution of ecosystems emphasizing the interplay of climate, geology, topography, and other factors in total ecosystems. Distribution, climatic and historical aspects. Prereq: 4310. 2 hrs and 2 labs. W

5350 Analysis of Plant Communities (4) Plants as ecosystems and ecosystems components considered from standpoint of genecology, ordination, and ecosystem function. Prereq: 4310. 2 hrs and 2 periods (field trips). Sp

5360 Marine Ecology (3) Relationships of marine organisms to environment and their interactions with each other. Trophic relationships in nontic, coastal and estuarine ecosystems; succession; deep-sea ecology; stability. Prereq: One previous ecology course.

5410-20-30 Seminar in the Teaching of College Botany (1, 1, 1) Objectives in teaching of general botany. Supervised teaching in general course; seminar in techniques, testing, concepts, and materials. Required of teaching assistants. Prereq: Consent of instructor. S/NC only. F

5440 Seminar in Botany (1) Readings and discussions of current literature and/or selected topics in botanical research. May be repeated. Maximum 12 hrs. S/NC only. E


5780 Plant Cytology (4) Intense consideration of cellular organization, structure and function, with emphasis on correlation where possible of ultrastructure, biochemistry and function of subcellular organelles. Principles of cytomorphology and analytical and electron microscopic techniques; cell fractionation and isolation of subcellular components; differentiation and cytological centrifugation of photomicrography and microcinematography. Intended for graduate students in the biological sciences. 2 hrs and at least 6 additional hrs in biological sciences. Sp, A
5820-21 Methods and Instrumentation in Laboratory Investigation (1, 1, 1, 1, 1) Laboratory course providing project experience and theoretical background in various research methods, including the use of radiation detectors, electrophoresis, poloriography, zonal and ultracentrifugation, gel chromatography, automatic analyzers, microscopy, culture methods, use and detection of radiotopes, and others. Prereq: Course in plant physiology, Chemistry 3211-21 or equivalent. Phys 2210-20-30 or equivalent. S, N.C only. E


5850-51 S-M-53-54 Methods and Instrumentation in Field Investigations (1, 1, 1, 1) Intensive field work using appropriate methods and instrumentation. Topics vary according to needs of students. May be repeated with consent of instructor. S, N.C only.

5870 Experimental Plant Genetics (4) Genetics of physiological adaptation, with some aspects including mechanisms of gene action, controlling elements, transformation, cytoplasmic inheritance, and adaptation. Biology 3110 and Chemistry 3211. 5 hrs and 1 lab, W.

5910-20 Developmental Plant Morphology (3, 3) Developmental mosaic of morphological elements of plant as an ecology of phenomena of morphogenesis-correlations, polarity, symmetry, differentiation, regeneration, tissue mixtures, abnormal growth, environmental and genetic factors. Prereq: 3010-20 or 4120, and 3210 or 5210 for 5910. 5 hrs for 5910 and 2 hrs and 1 lab for 5910. Prereq 5920, F, A, W.

6000 Doctoral Research and Dissertation (1-5) E

6010 Advanced Topics in Morphology of Vascular Plants (2-4) Needs of students to determine content. Topics selected from broad categories of experimental anatomy, morphology, and morphogenesis. Prereq: 3020-30 or 4120, 5810 or consent of instructor. May be repeated with consent of department.

6080 Advanced Topics in Cryptogamic Botany (2-4) Advanced studies and current research in experimental physiology, mycology, bryology, and/or developmental morphology of cryptogams. May be repeated with consent of department.


6420 Advanced Topics in Genetics (2-4) Literature survey of selected topics from all areas of genetics. Prereq: 3110; Biochemistry 4110-20. May be repeated with consent of department.

6520 Seminar in the History of Botany (2)

6820 Advanced Topics in Plant Physiology (4-5) Requirements of student determine content, including growth and growth hormones; minor element nutrition; radiation effects. Prereq: 5210; 1 yr college physics. May be repeated with consent of department.

6830 Advanced Topics in Ecology (2-4) Needs of student determine content, including community analysis; biogeochecmistry; bioclimatology; genee and palaeocology; radiation ecology; and system ecology. Prereq: 4310, 5340, 5350. May be repeated with consent of department.

6930 Advanced Topics in Systematic Botany (2-4) Needs of student determine content, such as morphological and evolution of vascular plants; bibliosystematics (systematic literature and code of nomenclature; current research in systematic classification of systematics; classes of classification of systematic. Seminars or lectures and labs depending on subject. Prereq: 5900, 5920. May be repeated with consent of department.

Chemistry

MAJOR DEGREES

Chemistry M.S., Ph.D.

Professors: G. Mamantov (Head), Ph. D. Louisiana State; N. S. Bowman, Ph.D. Princeton; G. A. Buehler1 (Emeritus), Ph.D., Ohio State; W. E. Bull, Ph.D. Illinois; J. D. Chambers, Ph.D. Kansas; J. A. Dean (Emeritus), Ph.D. Michigan; J. P. Eastham, Ph.D. California (Berkeley); W. H. Fletcher, Ph.D. Minnesota; C. W. Keenan, Ph.D. Texas; D. C. Keil, Ph.D. Princeton; J. W. Larson, Ph.D. Purdue, M. H. Hietzke, Ph.D. Wisconsin; G. D. Keil (Emeritus), Ph.D. Illinois; J. R. Peterson, Ph.D. California (Berkeley); G. K. Schuetzler, Ph.D. Illinois; D. A. Shutey (Emeritus), Ph.D. Illinois; A. Smith (Emeritus), Ph.D. Harvard; W. T. Smith (Emeritus), Ph.D. Ohio State; W. A. Van Hook, Ph.D. Johns Hopkins; E. L. Wehry, Ph.D. Purdue; T. F. Williams2, Ph.D. London; J. H. Wood (Emeritus), Ph.D. North Carolina State.

Associate Professors: J. E. Bloor, Ph.D. Manchester; F. A. Grimm, Ph.D. Cornell; G. W. Babakal, Ph.D. Purdue; J. K. Kintke, Ph.D. Akron; C. A. Lane, Ph.D. California (Berkeley); R. M. Magid, Ph.D. Yale; R. M. Pagni, Ph.D. Wisconsin; F. M. Schell, Ph.D. Indiana.

Assistant Professors: J. L. Adcock, Ph.D. Texas; J. D. Alexander, Ph.D. California (Berkeley); J. D. Kovac, Ph.D. Yale; L. J. Magid, Ph.D. Tennessee; M. J. Sepanick, Ph.D. Iowa State; C. Wode, Ph.D. North Carolina State.

Students majoring in Chemistry for the Master's or doctoral degree are required to present as a prerequisite one year each of general, analytical, organic and/or physical chemistry with a satisfactory record. Students lacking any of these prerequisites may be admitted with appropriate deficiencies which must be removed without graduate credit. For students entering in Chemistry, the prerequisite is two years of chemistry including quantitative analysis.

THE MASTER'S PROGRAM

The department offers specialization in nine areas for the M.S. degree: analytical chemistry, chemical physics, environmental chemistry, energy, inorganic chemistry, organic chemistry, polymer science, and physical chemistry. The requirements for the M.S. degree in Chemistry consist of the satisfactory completion of:

1. Research and a thesis to give 9 to 18 hours of graduate credit.
2. 4. Participation in seminar (5911-21-31) during the entire period of graduate study.
3. 4. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. A program leading to the M.S. degree with specialization in polymer science conducted jointly with the Department of Chemical, Metallurgical, and Polymer Engineering, which offers a degree with similar specialization. This specialization requires satisfactory completion of:
   1. Research and thesis to give 9 to 18 hours of graduate credit (5000).
   2. Chemistry 4160-70, 5531, 5140-50, Polymer Engineering 4910.
   3. Sufficient additional graduate course work in chemistry and/or related fields to make an overall total of 45 hours.
   4. Participation in Chemistry Seminar (5911-21-31) and the Polymer Seminar Program during the entire period of graduate study.
   5. A final oral examination.

The requirements for the M.S. degree in Chemistry with specialization in environment or energy consist of the satisfactory completion of:

1. Research and thesis on an environment- or energy-related problem to give 9 to 18 hours of graduate credit.
2. Sufficient additional graduate course work in chemistry and/or related fields to give a total of 45 hours. For emphasis in energy, those additional courses must include Chemistry 5220, 5250-60-69-70-79, Ecology 5310, and Environmental Engineering 4030. For emphasis in environment, those additional courses must include Chemistry 5420, 5460-70-30 or 5250-60-70 or 5420-60 or 5710-20-30, 5810), and Mechanical Engineering 4180. All course selections must be approved by the appropriate departmental committee.

3. Participation in seminar (5911-21-31) during the entire period of graduate study. (No more than 3 credit hours of seminar may be applied to the above requirements.)
4. A final oral examination.

THE DOCTORAL PROGRAM

The department offers specialization in nine areas for the Ph.D. degree: analytical chemistry, chemical physics, environmental chemistry, energy, inorganic chemistry, organic chemistry, polymer science, and theoretical chemistry. For the Ph.D. degree in Chemistry with specialization in analytical, inorganic, organic, physical, or theoretical chemistry, the satisfactory completion of the following is required:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70 and two of the following: 5511, 5521, 5531.
3. Sufficient additional graduate course work in chemistry and/or related field to make an overall total of 45 hours.
4. The following additional hours must include one of the following sequences: 5110-20-29-30, 5250-59-69-70-79, 5340-50, 5410-20-30, 5710-20-30.
5. A final oral examination.

1 Alumni Distinguished Service Professor.
Metallurgical, and Polymer Engineering, which offers a degree with similar specialization. This specialization requires satisfactory completion of:

1. Research and a dissertation to give at least 36 hours of graduate credit (6000).
2. Chemistry 4160-70, 5511, 5410-50, 5160 or 5170, Polymer Engineering 4910.
3. Participation in Chemistry Seminar (5911-21-31) and the Polymer Seminar Program during the entire period of graduate study.
4. Thirty hours of additional graduate course work, including at least 6 hours at the 6000 level and at least 12 hours from the Department of Chemistry offerings.
5. A comprehensive advanced examination in polymer science.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
7. A final oral examination.

**3211-21-31 Organic Chemistry (3, 3, 3) Compounds of carbon and their reactions, reaction mechanisms, spectroscopic and other physical properties. Must be taken with 5110-20-30. Corresponding laboratory (3219-29-39) is a coreq for students not having credit for the lecture.**

**3219-29-39 Organic Chemistry Laboratory (1, 1) Experiments on topics discussed in 3211-31. Corresponding lecture (3211-21-31) is a coreq for students not having credit for the lecture.**

**3410-20-30 Physical Chemistry (3, 3, 3) Behavior of gases, first, second, and third laws of thermodynamics. Introduction to chemical equilibrium, 3420—Chemical equilibrium, phase equilibria and properties of irreversible processes. Kinetic theory of gases. 3430— Kinetics of chemical reactions. Introduction to quantum mechanics, application to simple systems. Molecular spectroscopy and structure.**

**4170-Gases and chemical equilibria, solutions, phase equilibria, reaction kinetics and electrochemistry.**

**4219 Advanced Analytical Chemistry Laboratory (1) Experiments on topics discussed in 4220. Coreq: Analytical chemistry.**

**4220 Advanced Analytical Chemistry (3) Electroanalytical methods of analyses (including polarography, coulometry, titrimetry, and voltammetry); magnetic resonance methods; mass spectrometry, x-ray absorption and fluorescence techniques.**

**4229 Advanced Analytical Chemistry Laboratory (1) Experiments on topics discussed in 4220. Coreq: Analytical chemistry.**

**4420 Physical Inorganic Chemistry (3) Theoretical concepts leading to an understanding of inorganic chemistry; quantum theory of the atom, principles of molecular structure, and elementary nuclear chemistry.**

**4430 Intermediate Inorganic Chemistry (3) Application of theoretical concepts to inorganic elements, their chemical states, and their reactions.**

**4510 Organic Qualitative Analysis (3) Identification of pure organic compounds and mixtures. Pre-req: 3111-21-31, 3119-29-39 or 3129, 3529-39, 3 lab. Not open to students who have completed 4610.**

**4550 Organic Reaction Mechanisms (3) Pre-req: 1 yr of organic chemistry, W.**

**4610-20 Advanced Chemical Experimentation (2, 5) Laboratory course designed to provide modern experimental techniques to solution of chemical problems.**

**4910-20-30 Biophysical Chemistry (3, 3, 3) Physicochemical principles with application to biological systems. Must be taken in sequence. Not open to students having 3410-20-30, 4910—Gases; first, second and third laws of thermodynamics; equilibrium, 4920—Solution chemistry; electrochemistry; kinetics; nuclear chemistry. 4930—Elementary quantum chemistry; optical and magnetic spectroscopy; light scattering; macromolecular properties.**

**5000 Thesis (1-5) E.**

**5110-30-35 Advanced Organic Chemistry (3, 3, 3) Structure, reactions and reaction mechanisms of aliphatic, aromatic, and alicyclic compounds.**

**5120 Advanced Organic Chemistry Laboratory (3) Synthesis of organic compounds illustrating modern techniques.**

**5139 Spectroscopic Characterization of Organic Compounds (2) Structure elucidation using spectroscopic methods; nuclear magnetic reso-
1510 Introductory Polymer Chemistry (3) Fundamental principles, role of chemistry in interdisciplinary field of polymer science; relation of molecular structure to bulk properties of polymers. Prereq: 1 yr of physical chemistry. 5410 and 4160-70 or equivalent.

1540 Organic Chemistry of Polymers (3) Synthesis of monomers; mechanism, stereochemistry, and sequence distribution of polymerizations. Formation of block, graft, and network polymers. Reactions on polymers, including degradation. Prereq: 5140 and 5531. A

1570 Physical Chemistry of Polymers (3) Rubber elasticity, solution properties of macromolecules; structural, configurational, and conformational statistics of polymers. Prereq: 5145. A

5220 Analytical Chemistry of Environmental Pol- lutants and Application of Modern Analytical Chemistry to Problems in Aquatic and Atmospheric Pollution. Prereq: 5250-60-70 or consent of instructor. Sp

5240 Chemical Instrumentation (4) Principles of chemical instrumentation. Practice in design and construction of chemical instruments; special projects. Prereq: Consent of instructor.

5250-60-70 Advanced Analytical Chemistry (3, 3, 3) 5250—Absorption and emission spectrophotometry, structure elucidation by IR, NMR, UV, and mass spectra; 5260—Chemical separation methods: solvent extraction, chromatography, electrophoresis, membrane methods; fluorescence and x-ray methods; 5270—Electroanalytical, magnetic and thermal analytical methods; on stream and automatic analysis. Prereq: 1 yr of physical chemistry. F, W, Sp

5259-69-79 Advanced Analytical Chemistry Laboratory (1, 1, 1) Experiments in use of chemical separation methods and instrumental methods covered in concurrent lecture course. Prereq: 1 yr of physical chemistry. Prereq or coreq: 5250 for 5259; 5260 for 5269; 5270 for 5279. F, W, Sp

5340 Quantum Chemistry (3) Postulate approach to fundamental principles of quantum mechanics. Accurate solutions to Schrödinger equation; approximate (ab initio and semiempirical) molecular orbital methods; calculation of molecular properties. F

5350 Quantum Chemistry (3) Electronic excited states of molecules; dynamic theory; perturbation theory; reactivity of organic molecules. Prereq: 5340. W

5410-20-30 Advanced Physical Chemistry (3, 3, 3) 5410—Classical thermodynamics, 5420—Molecular spectroscopy and structure, 5430—Chemical kinetics. Prereq: 4110 or 4160-70. F, W, Sp


5511 Survey of Inorganic Chemistry (3) Atomic structure, wave mechanical atoms, ionic and covalent bonding, periodic relationships of elements, introduction to coordination chemistry, and descriptive chemistry of the elements. F

5521 Survey of Analytical Chemistry (3) Volumetric and gravimetric analysis; acid-base, oxidation-reduction, complexation, and precipitation equilibria; spectroscopic, electroanalytical, and separation methods. F

5531 Survey of Organic Chemistry (3) Bonding in organic molecules, chemistry of hydrocarbons, allotropic forms of carbon, functional oxygenated derivatives, carbonyl compounds, stereochemistry, aromatics, and spectral analysis of organic molecules by infrared, ultraviolet, nuclear magnetic resonance and mass spectral techniques. F
3230 Roman Mythology (3) Study of myths created by Romans, as well as those the Romans borrowed from the Greeks, with reference to Roman attitudes toward history, religion, and society. Readings, lectures, slides, and discussion. (Same as Religious Studies 3230.) P

3310 Art and Archaeology of the Aegean Bronze Age and Early Greece (3) Troy, the Cyclades Islands, Greek mainland, and Crete. Emphasis on palaces of Crete and Mycenae, Tiryns and Pylos, their fall, the following Dark Age, and rebirth of Greek civilization. Illustrated lectures. W

3320 Art and Archaeology of Archaic and Classical Greece (3) Survey of development of Greek architecture, sculpture, and painting from 850 B.C. to death of Alexander. Illustrated lectures. W

3330 Art and Archaeology of Hellenistic Greece and Rome (3) Hellenistic Greek, Etruscan, and Roman sculpture, painting, and architecture with attention to city planning. Illustrated lectures. Sp

3340 Cities of the Greek and Roman World (3) Archaeological survey of Greek and Roman cities from 3000 B.C. to 500 A.D. With emphasis on development of city planning and quality of life. Such cities as Mycenae, Athens, Priene, Alexandria, Rome, and Lepcis Magna will be studied. F

3350 Shrines and Sanctuaries of the Greek and Roman World (3) Survey of major shrines and sanctuaries of Greek and Roman world with emphasis on archaeological remains. Such sites as Olympia, Epidauros, Parthenon, Curve, Paphos, Gortyn, and Baalbek will be considered. Readings in selected classical authors will add to understanding of place of great shrines and sanctuaries in Greek and Roman life. Sp

4010 Greek Drama in English Translation (3) Survey of dramatic masterpieces of Greek literature. A

4210 Teaching of Latin (3) Carries no language credit. A

4230 Classical Mythology and its Uses (3) Intensive review and survey of Greek and Roman mythology. Emphasis on uses of classical mythology in literature, music, and plastic arts, especially of modern times. A

4510 Selected Readings in Latin Literature in Translation (3) Content varies. May be repeated with consent of department. A

4610 Studies in Classical Archaeology (3) Variable content course offering subject matter not taught in existing courses, or concentrating on one aspect of existing survey. Prereq: Consent of department. A

5620 Problems in Old World Archaeology (3) (Same as Anthropology 5620.) A

**Computer Science**

**MAJOR**

Degree: M.S.

**Professors:**

- R. M. Aiken, Ph.D. North Texas
- R. C. Gonzalez, Ph.D. Florida (Electrical Engineering)
- T. Gregory, Ph.D. Illinois Mathematics
- J. Sherman, Ph.D. Purdue (Director of Computing Center)

**Associate Professors:**

- C. Donatson, Ph.D. Texas
- F. A. Figg, Ph.D. Texas (Aerospace Engineering)
- E. L. Hall, Ph.D. Missouri (Electrical Engineering)
- K. C. O'Kane, Ph.D. Pennsylvania State
- F. Pilloig, Ph.D. Pennsylvania State
- M. A. Thompson, Ph.D. Duke

**Degree Requirements**

1. **Mathematical and Scientific Credit:** at least equivalent to that of a student who has completed the calculus sequence through one year of multivariable calculus and matrix algebra.
2. Computer Science 3155 or an equivalent introductory course in the programming language used in the introductory course.
3. An introduction to probability and statistics at least at the level of Statistics 3450.
4. Computer Science 3175 or an equivalent introductory course in discrete structures or logical foundations of computer science.
5. Computer Science 2610, 2710 and 3520 or equivalent courses in advanced FORTRAN programming, machine organization and assembler language programming.

**ENTRANCE REQUIREMENTS**

All students must receive departmental credit or exhibit proficiency in the following courses:

1. Computer Science 4550, 5100 and 5109.
2. Electrical Engineering Computer Science 5175 and 5940.
3. One of the three courses: Computer Science 4710, 4730, or 4225. The student may then select either Plan A or Plan B.

**Plan A: Thesis Option**

1. Complete 36 hours of courses at the 4000 level or above. These must include at least 18 hours at the 5000 level in addition to the 5000 level courses already required for the degree.
2. Complete at least 9 additional hours of thesis credit. Computer Science 5500.
3. Pass an oral examination by a committee of at least three faculty members.

**Plan B: Non-Thesis Option**

1. Complete 45 hours of courses at the 4000 level or above. These must include at least 27 hours at the 5000 level in addition to the 5000-level courses already required for the degree.
2. Pass written and oral comprehensive examinations.

**Minor**

Under either plan, a student wishing to count a course from another department towards the graduate degree must have prior written approval from the computer science graduate committee.

**3150 Introduction to Numerical Algorithms and Programming** (3) Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations. Introduction to programming in FORTRAN. 3150 and 3155 may not both be taken for credit. Students with a knowledge of FORTRAN should take 3155. Prereq or coreq: Mathematics 2960. (Same as Mathematics 3150.)

**3155 Introduction to Numerical Algorithms** (3) Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations. 3150 and 3155 may not both be taken for credit. Students with a knowledge of FORTRAN should take 3155. Prereq: 1510 or 1610 or consent of instructor. Prereq or coreq: Mathematics 2960. (Same as Mathematics 3155.)

3715 Discrete Structures (3) Introduction to discrete structures useful in computer science. Sets, graph theory, logic, proofs, relations, functions, recursion, induction, De Morgan's Laws, propositional calculus, automata, and finite state machines. Prereq or coreq: Mathematics 2860. (Same as Mathematics 3715). F, Sp

3725 Advanced Discrete Structures (3) Advanced topics in discrete structures useful in computer science. Graphs and algorithms for manipulating data, algebraic structures, Boolean algebra, lattices, groups, propositional, modes. Prereq: 3715 or equivalent. (Same as Mathematics 3725). W

4050 Number Systems for Digital Computers (3) Floating-point number representation, fixed-point number representation, multiple-modulus residue number representation, finite-segment p-adic number representation, errors in floating-point computation, finite fields and exact computation using digital computers. Prereq: 3155. F


4225 Numerical Solutions to Equations and Numerical Approximations (3) (Same as Mathematics 4225). F, W

4235 Numerical Linear Algebra (3) (Same as Mathematics 4235). F, W

4310 Statistical Data Processing (3) FORTAN language and FORTRAN oriented programs for statistical data, SPSS and SAS programs for standard statistical analyses: frequency distributions, percentiles, data reduction correlation and regression, analysis of variance. Not for credit for computer science majors. Prereq: Statistics 2100 or equivalent. F, Sp

4330 Independent Study in Computer Science (1-3) Special project in area of student's primary interest. To be directed by Computer Science faculty, perhaps jointly with student's faculty advisor. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

4340 Interactive Statistical Data Processing (3) Statistical data processing using interactive computer system: time-sharing utility and statistics programs as part of FORTAN system. Not for credit for computer science majors. Prereq: Statistics 2100 or equivalent and 4310 or knowledge of a procedure-oriented language such as FORTAN. W

4470 Programming Languages (4) Comparison and analysis of programming languages, design, features and implementation. Processors, operations, sequence control, data control and storage management. Detailed discussion and programming experience in LISP and either SNOBOL, APL, or SIMULA. Prereq: 4510.

4510 Data Structures and Non-Numeric Programming (3) Data structures and algorithms for their manipulation. Arrays and orthogonal lists; stacks, queues, rings, doubly-linked lists, trees, dynamic storage allocation; organization of files; programing languages for information structures. Prereq: 2710 and 1610 or 2610.

4550 Systems Programming (3) Computer organization and programming. Machine language and design of computers, representation of information, microprogramming, software systems, input/output programs, interpreters, microprocessors, macroassemblies. Prereq: 3520 or equivalent. E

4570 Introduction to Data Base Management Systems (3) Hierarchical, network and relational models: logical and physical views of data, data independence and data manipulation languages. Data independence, implementation and operational considerations: performance, integrity, security, and reliability. Prereq: 4510 and 4550 or equivalent. Students may not receive credit for both 4570 and 5570. W

4610 Operating Systems—Concepts and Facilities (3) Detailed examination of major operating systems. Memory, processor, device and data management, interrupt processing, input/output, loaders and relocation, device characteristics, data set organizations, SPOOLing. Prereq: 4510 and 4550. Students may not receive credit for both 4610 and 5670. F

4620 Operating Systems—Case Studies (3) Alternatives in operating system design, dynamic reorganization, paging, segmentation, time sharing, time slicing, protection, concurrency, real time systems. Examples from different operating systems analyzed as appropriate. Prereq: 4610 or equivalent or consent of instructor. W

4660 Compiler Construction (3) Practical experience with design of compilers. Scanning, parsing, semantic processing, code generation and optimization, error detection and correction. Term project includes a complete compiler for a small block-structured language. Prereq: 4510. W

4710 Formal Languages and Automata (3) Grammars of Chomsky hierarchy and their recognizers. Properties of language, machine equivalence, emphasis on regular and context-free languages. Introduction to computability and enumerability. Prereq: 3715. F, Sp


4750 Interactive Computer Graphics (3) Point plotting, vector generation, interactive graphical techniques, two- and three-dimensional transformation, perspective depth, hidden line elimination, shading, software and hardware system design. Discussion of use of these techniques in design, problem solving, mapping, architecture, and many other areas. Prereq: Senior standing in Computer Science, Electrical Engineering or Geography and a knowledge of computer programming, or consent of instructor. (Same as Geography 4750).

4820 Introduction to Pattern Recognition (3) (Same as Electrical Engineering 4820) W

4830 Digital Image Processing (3) (Same as Electrical Engineering 4830). Sp

4850 Small Computer Systems (3) (Same as Electrical Engineering 4850). E

4910 Analysis and Management of Computer Installations (3) Analysis of computer systems; implementation, justification, personnel in systems, perspective on systems. Prereq: 3520 or equivalent. W

4980-90 Special Topics in Computer Science: 1-4, 1-4) Credit determined at registration. Prereq: Recommendation of Computer Science staff. May be repeated with consent of department. Maximum 9 hrs.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses library facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5010 Computer-assisted Instruction (3) History and development of CAI systems. Emphasis on studying success and failure of major projects, future role of CAI in education. Use of a CAI programming language to implement a CAI course. Prereq: Programming experience or consent of instructor.

5050 Computer Modelling and Simulation of Physical Systems (3) Techniques for computer modeling and simulation, inputs, driving functions, errors, outputs, interactive simulations as applied to various physical systems. Models to represent spatially extended quantized systems: 3510 or 3165, and 3520 and Statistics 3450. A

5100 Immigration to Computer Science (5) Designed for graduate students with limited computer science background, emphasizing computer science major or minor program. Advanced programming techniques in FORTRAN; control of input-output devices; language and grammar features; programming languages programming; introduction to data structures and algorithm analysis. Prereq: 1510 or 1610 or 3520 or consent of instructor. W

5109 Immigration to Computer Science Practicum (2) Design and implementation of medium to large-scale computer programs. Coreq: 5100. W

5175 Introduction to Logic Design (3) (Same as Electrical Engineering 5175).

5210 Artificial Intelligence (3) Simulation of intelligent processes by computer. Techniques of representation, search, and manipulation for various areas; problem solving, game playing, pattern perception, theorem proving, semantic information processing, computer simulation of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5560.) W

5250 Medical Computing (3) Achievements and problems associated with the application of computer technology to field of health care. Various areas of medical computing: laboratory data systems, patient monitoring systems, diagnostic imaging, management of patient records, automatic history taking, and hospital administration systems. Prereq: 4510. Sp

5430 Advanced Compiler Design (3) Design and implementation of interpreters and compilers, including low-level grammars, compiler-compiler, incremental compilation, runtime organization, data flow analysis, optimization, and error recovery. Prereq: 4660 and 4710. A

5455 Finite Difference Methods for Partial Differential Equations (3) (Same as Mathematics 5455). F

5465 Finite Element Methods (3) (Same as Mathematics 5465). W

5475 Advanced Topics in Numerical Partial Differential Equations (3) (Same as Mathematics 5475). Sp

5570 Database Management Systems (3) Data model theory, comparison of several existing data base systems, implementation technology, selection and evaluation techniques, integrity, security, authorization and protection, hardware architectures, and future trends in database systems. Prereq: 4510 and 4550 or consent of instructor. W

5565-65-75 Numerical Mathematics (3, 3, 3) (Same as Mathematics 5565-65-75). F, W

5670-80 Advanced Operating Systems (3, 3) Theory and analysis of operating systems. Synchrobization and deadlocks. Analysis of operating systems using mathematical models, simulation, and hardware and software monitors. Comparison of good hard heuristic scheduling algorithms with best possible schedules; scheduling anomalies. Case studies of virtual memory systems. Analysis of page swapping and placement strategies. Prereq: 4610 or equivalent or consent of instructor. Sp, A

5710 Finite Automata Theory (3) Finite-state sequential machines. Minimization, experiments, de-composition. Regular sets and regular expressions. Nondeterministic, incompletely specified and linear automata. Prereq: 4710. A

5730 Computability and Computational Complexity (3) Computability and decidability: Turing machines and halting problem. Register machines: Recursive and recursively enumerable sets; partial and total recursive functions. Time and space bounded computations, the \( P \) vs \( NP \) problems. Prereq: 4710. Sp, A

5750 Theory of Formal Languages (3) Phrase-structure languages, their generators and processes; context-free, context-sensitive, recursive and recursively enumerable languages and grammars; deterministic context-free languages. Theory of translation. Prereq: 4710. W
subjects other than English. Normally a student with the M.A. from another university may transfer at least 36 quarter hours.

After all, or most, of the course work has been taken and after the two language requirements have been satisfied, the student will take four comprehensive examinations from several areas divided as the department directs. Successful completion of these examinations will be followed by the writing of the dissertation and by an oral examination in the field of the dissertation.

Any course in the 5000 or 6000 series may be repeated for credit with the permission of the department.

121 Written and Oral English for Foreign Students (3) Rapid review of English grammar structures and pronunciation with intensive work on oral and written drill. Required during the first quarter of residence of all foreign students (graduates, undergraduates, and transfer students) who are not excused from it on the basis of the English Proficiency Examination required of every new foreign student.

A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

1221 Written and Oral English for Foreign Students (3) Emphasis on more advanced structures of English grammar and on paragraph writing. Required during the first quarter of residence of foreign students who on the English Proficiency Examination demonstrate need for work in English structure, but not at the intensive level of English 1211. Required also of foreign students who complete 1211. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

2070 Modern British Poetry (3) From Housman to Thomas and more recent poets.

2080 Modern American Poetry (3) From Robinson to Stevens and more recent poets.


3120—Emphasis on Byron, Blake, and Scott.

3130—Emphasis on Shelley and Keats. F; W; Sp

3135 Tennyson and His Successors (3) Includes such poetry as that by the Pre-Raphaelites, humorists, and Decadents.

3136 Browning, Arnold, and Hopkins (3)

3150 Melville (3)

3210-20 English Literature and Culture of the Nineteenth Century (3, 3) Survey of literature dealing with leading movements in politics, science, religion, and the arts. 3210—1800 to 1833. 3220—1833 to 1857. 3230—1857 to 1914.

3411-12-20 Modern Drama (3, 3, 3, 3) 3411—Contemporary from 1920 to 1930.

3420—British. 3430—American.

3510 Sixteenth-century Prose and Poetry (3) More and Wyatt to Spenser. A

3520 Elizabethan Drama (3) Marlowe, Jonson, and others. A

3530 Jacobean Drama (3) Beaumont and Fletcher to Massinger and Shirley.

3610 Restoration and Eighteenth-century Poetry (3) Restoration; heroic and pastoral; Dryden. F; W; Sp

3620 Restoration and Eighteenth-century Drama (3) Dryden through Sheridan.

3630 Restoration and Eighteenth-century Prose (3) Defoe, Addison, Steele, Swift, and others.

3670 The Age of Johnson (3)

3710 Literature of the English Bible (3) Types of Old Testament literature, excluding wisdom literature. A

3711 Literature of the English Bible (3) Old Testament Wisdom literature and types of New Testament literature. A

3721 Introduction to Folklore (3) Essential terms and concepts in modern folklore—folk life studies. Emphasis on American materials; folk tales, folk song, myth, legend, proverb, riddles, superstitions, dance, games, and architecture.

3910-20-30 Comparative Literature (3, 3, 3) 3910—Ancient. 3920—Medieval and Renaissance. 3930—Modern. A

3940 The Novel of the Contemporary Western World (3) Proust, Joyce, Mann, and others. A

4010-20 Shakespeare (3, 3) 4010—Early plays, c. 1560-1601, including Henry IV, Twelfth Night, and Hamlet. 4020—Later plays, 1601-1613, with emphasis upon tragedies and dra, lactic romances. E

4042-43 Topics in Genre and Mode (3, 3) Content varies. Special topics in principal forms and modes of British and American literature, e.g., comedy, tragedy, epic, lyric, satire, etc. May be repeated with consent of department. Maximum 6 hrs each.

4045-46 Topics in Literary Theory and Criticism (3, 3) Content varies. Special topics in theoretical and practical approach to British and American literature. May be repeated with consent of department. Maximum 6 hrs each.

4050-60-70 American Novel (3, 3, 3) 4050—From earliest sentimental novels through Brown, Cooper, Cooper, Irving, 1820. 4060—Henry James and Mark Twain through early works of Faulkner and Hemingway. 4070—Early thirties to present. A

4090 Topics in Film Study (3) Content varies. In-depth study of particular directors, film genres, national cinema movements, or other topics. May be repeated with consent of department. Maximum 6 hrs. A

4140-50 Technical Writing (3, 3) 4140—For students planning careers in the physical, life and health sciences, engineering, agriculture, and forestry. Writing proposals, laboratory and progress reports, abstracts and journal articles. 4150—Writing of scientific feature articles in which data are marshaled and analyzed for human interest. F, W, Sp

4250 Advanced Fiction Writing (3) Further development of skills acquired in basic Writing Fiction course. Prereq: 3450 or consent of instructor.

4254 Writing the Detective and Mystery Story (3) Instruction and writing cover entire crime field—suspense, detective, procedural, private eye, spy, police, adventure fiction. Recommended prereq: 3450-70-60 or consent of instructor.

4256 Writing Science Fiction and Fantasy (3) Survey of general development and basic texts of Science Fiction, Speculative Fiction and Fantasy. Exercises in writing in genres, in accordance with technical questions learned in basic Writing Fiction course.

4270 Advanced Poetry Writing (3) Further development of skills acquired in basic Writing Poetry course. Prereq: 3450 or consent of instructor.

4310-20-30-40 The British Novel (3, 3, 3, 3) 4310—Defoe to Jane Austen. 4320—Scott to Thackeray. 4330—George to Galsworthy. 4340—James Joyce to present.

4400 Sociolinguistics (3) Exploration of language patterns in terms of correlations between them and their social context. Examination of effects of language upon culture, and vice versa. Prereq: 3330 or consent of instructor. (Same as Linguistics 4440.)

4450 Dialectology (3) Theories and methodologies of dialect research, fieldwork, and analysis. Prereq: 3340 or consent of instructor. (Same as Linguistics 4450.)

4455 Varieties of English (3) Theories, methodologies, and findings of English and American dialectology with emphasis on implications for cultural pluralism. Prereq: 3330 or consent of instructor.

4460 Special Topics in English Linguistics (3) May be repeated with consent of department. (Same as Linguistics 4460.)

4471-81 English as a Second or Foreign Language (3, 3) 4471—Applied linguistics in teaching and learning English as a second or foreign language. Phonological and grammatical structure of present-day English. Analysis of differences (phonological, grammatical) between English and another language. Prereq: Second year of a foreign language. 4481—Materials and methods of language teaching and testing. History of materials and structured teaching situations. Theory of testing language competence and performance, with emphasis on construction of tests. Team teaching with an experienced member of the staff. Prereq: 4471. (Same as Linguistics 4471-81) W; Sp

4510-20-30 Black Literature (3, 3, 3) Trends and developments.

4651 Southern Literature through the Nineteenth Century (3) Southern writing from colonial period to end of nineteenth century, including frontier humorists and local color writers.

4652 Southern Literature in the Twentieth Century (3) Modern Southern literary renaissance, the figures and Agrarians, Faulkner and significant writers such as Welty, O'Connor, and Porter.

4660 Emerson and Thoreau (3)

4660 American Humor through Mark Twain (3)

4721-31-41 Ballad and Folktales (3, 3, 3) 4721—Study of traditional English and Scottish popular ballads and their North American variants; 4731—Study of native American ballad and folktales. 4741—The folk narrative; functions, categories, and patterns of storytelling.

4850 Milton (3) Emphasis on major poems. A

4860 Seventeenth-century Prose and Poetry (3) Bacon and Donne to Marvell. A

4930-40 Chaucer (3, 3) 4930—The Canterbury Tales. 4940—Trollope and Crasseyde and early poems.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5101 Foreign Study (1-12) See page 97.

5102 Off-campus Study (1-12) See page 97.

5103 Independent Study (1-12) See page 97. E

5110 Teaching Expository Writing (1) Using essays and personal experience as bases for Freshman Composition. Weekly sessions on how to prepare and teach such a course. Grading of sample papers; supervised teaching; observation of other teachers. Required of all first-year Teaching Assistants. S/NC only. F

5120 Teaching Writing about Literature (1) Variety of literary works as subjects for student response and analysis. Same format as 5110. S/NC only. W

5130 Teaching Business and Technical Writing (1) Forms and strategies appropriate to memos, letters, abstracts, reports, and proposals. Same format as 5110. S/NC only. Sp

5150 Old English Prose (3) A

5170-80 History of the English Language (3, 3) 5170—Phonetic transcription, Old English, development of inflection and syntax. 5180—Middle and Early Modern English, developments in pronunciation and vocabulary. F; W

5210-20-30 Reading in American Literature from the Colonial Period to the Present (3, 3, 3) F; A; W; A; Sp; A

5240 Readings in Black American Literature (3) Critical analysis of poetry, prose, drama, criticism;
French

See Romance Languages

Geography

MAJOR

DEGREES

Geography

M.S., Ph.D.

Professors:

S. R. Jumper (Head), Ph.D. Tennessee; C. S. Aiken, Ph.D. Georgia; E. H. Hammond, Ph.D. California (Berkeley); L. M. Millar, Ph.D. Syracuse; T. H. Schumcke, Ph.D. Wisconsin.

Associate Professors:

T. L. Bell, Ph.D. Iowa; L. W. Brinkman, Jr., Ph.D. Wisconsin; J. R. Carter, Ph.D. Georgia; C. T. Falland, Ph.D. Denver (UT Space Institute); J. B. Rehder, Ph.D. Louisiana State.

Assistant Professors:

R. Forrest, Ph.D. Rutgers; L. Pulipher, Ph.D. Southern Illinois; B. Railston, Ph.D. Northwestern.

The Department of Geography offers the degrees of Master of Science and Doctor of Philosophy with concentrations in geography of development, physical geography and human systems, regional geography, geography of Anglo-America, and rural and nonmetropolitan geography.

THE MASTER’S PROGRAM

The department requires a minimum of 45 quarter hours beyond completion of a sound undergraduate major program. At least one-half of the total courses in the graduate program must be at or above the 5000 level, of which no more than 9 hours may be thesis courses, and must include 5150, 5160, and (at each offering during residency) 5100. Thesis and final examination required.

THE DOCTORAL PROGRAM

The doctorate is a research degree and is granted only to those persons who demonstrate proficiency in conducting independent research. Students must have achieved 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 department, but outside the areas of specialization, to give a broad foundation and understanding of the discipline. The program must include 5160, 5170, 5270, and (at each offering during residency) 5100. A minimum of 15 hours in credit must be earned in related fields outside the department. Competence in a foreign language, cartography, and quantitative techniques is required. Other techniques pertinent to the student’s areas of specialization may be required. The language will be French or German unless otherwise approved by the student’s faculty committee. Comprehensive examinations required for admission to candidacy include a written comprehensive, written examinations on two special fields, and an oral examination on the student's program, the special fields, and an oral examination on the student's program, the special fields, and an oral examination on the student’s doctoral committee.

3410 Intermediate Economic Geography (4) Concepts, theories, and practices in location planning, locational patterns in agriculture, manufacturing, and service activities. For W

3430 Urban Geography (4) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. For W

3450 Rural Geography (4) Geographical appraisal of rural areas of the United States, including small towns and urban fringes. Problems and potentials of rural America. For W

3490 Geography of Resources (4) Study of factors related to variation in resources availability from time to time and from place to place, with particular emphasis upon energy and metallic resources. For Sp

3520 Climatology (4) General circulation system leading to W. Major physical processes, Climatic change and modification, interrelationship of climate and human activity. W or Sp

3530 The Land-Surface System and Man (4) Nature and regional variations in relationships among surface form, water, vegetation, and surface materials. Human as evaluator and agent of change. F, Su

3510 Political Geography (4) Importance of geographic factors underlying political and geographically determined boundaries between nations; spatial implications of political decision-making processes; geography of administrative units. F

3660 Cultural Geography (4) Basic concepts of culture; methods and background of cultural geography; world patterns of cultural phenomena. Sp

3790 Geography of Middle America (4) Covers Mexico, Central America, and the West Indies. F

3800 Geography of South America (4) W

3870 Geography of Asia (4) A survey of the physical, cultural, and economic characteristics of the countries of Asia, excluding the Soviet Union.

3910 Regional Geography of United States and Canada (4) Major physical, economic, and social distributions as they interrelate to give distinctive character to regions of United States and Canada.

3920 Geography of the American South (4) Geographical appraisal of southeastern United States, including physical environment and human resources. Origin and development of contemporary economic and cultural traits of the area.

3940 Geography of Appalachia (4) Interrelation of physical, economic, and social distribution patterns as they give distinctive character to the region and its parts, especially Southern Appalachia.

4075 Geography of Transportation (4) Geographic examination of transportation systems, emphasizing transport of people on highways and by public facilities. Relationship of geographical systems to changing geography of cities and urban hinterlands.

4100 Quantitative Methods in Geography (4) Geographic applications of statistical techniques, point pattern analysis and analysis of areal units. Prereq: Mathematics 5000 or consent of instructor.

4210 Problems in Geographic Method (4) Examples of problems and approach in geographic analysis and synthesis. Emphasis on geometric, areal sampling, generalization, and regionalization, and questions of scale.

4240 Historical Geography of the United States (4) Survey of changing human geography of United States during four centuries of settlement and development. Emphasis upon changing population patterns, development of agricultural regions and patterns of urban development.

4510 Principles of Geomorphology (4) Same as Geology 4510.

4550 Geography of Soils (4) Soils as physical systems and their relationship to environments. Investigation of specific cases of the role of soil in environmental systems.
4510 Industrial Geography (4) Factors affecting location of manufacturing activities, with emphasis on the United States. Prereq: 3410 or consent of instructor. A

4630 Geography of Agriculture (4) A

4710 Cartographic Design and Production (4) Principles and practice of design, construction, and reproduction of maps. Recommended prereq: 3700. 2 hrs and 2 labs.

4720 Data Mapping (4) Automated techniques of representing surfaces, using geographic information systems. Recommended prereq: 3700 and knowledge of a computer language. F

4730 Advanced Cartography (4) Map production from design through color proofs. Prereq: 3700, 4710, and 4720 or consent of instructor. Su

4740 Remote Sensing: Types and Applications (4) Basic principles and uses of aerial photography and other remote sensing techniques. Emphasis upon value of various types of imagery for geographic interpretation and simple mapping. Prereq: Consent of instructor. F or Sp

4750 Interactive Computer Graphics (3) (Same as Computer Science 4750.)

4799 Practicum in Cartography/Remote Sensing (2-6) May be repeated. Maximum 6 hrs. E

5000 Thesis (1-15) E

5100 Colloquium in Geography (1) Discussion of departmental research, current research literature, and general topics. Registration at each offering required of resident graduate students. May be repeated. Maximum 8 hrs. S, N/0 only: W, Sp

5101 Foreign Study (1-12) See page 97. E

5102 Off-campus Study (1-12) See page 97. E

5150 Introduction to Geographical Research (3) Aims of geographical research; survey of printed source materials; practice in effective presentation of research findings. F

5160 Research Design and Field Problems (4-6) Development of research problems, preparation of appropriate study designs, and practical field applications. Su

5170 Geographic Concept and Method (2) Traditional and modern thought regarding nature, scope, problems, and methods of geography. A

5200 Special Problems in Geography (2-6) Reading and research on problems or topics of interest to individual students. Students must define topic and receive instructor's approval of study plan before registering for course. May be repeated with consent of instructor. E

5250 Topics in Historical Geography (3) Examination of trends, concepts and methods in historical geography. Prereq: 4240 or consent of instructor. A. Must be repeated with consent of instructor. Maximum 9 hrs. A

5260 Advanced Cultural Geography (3) Geographical analysis of rural settlement in Eastern United States, with emphasis upon New England, Tidewater East, and Upland South, and specific application to Southern Appalachians. Includes field work and final paper. Prereq: 3560 or consent of instructor. A

5270 Topics in the Geography of the American South (3) Geographical perspective on economic and cultural aspects of southeastern United States. Topics vary. May be repeated with consent of instructor. Maximum 9 hrs. A

5280 Advanced Topics in Economic Geography (3) Examination of trends, problems, and methods in modern economic geography. Prereq: 3410 or consent of instructor. May be repeated. Maximum 9 hrs. A

5520 Advanced Urban Geography (3) Analysis of research on urban systems, internal morphology, urban problems and urban spatial behavior. Prereq: 3430 or consent of instructor. A

5550 Topics in Geography of Land-Surface System (3) Examination of trends, problems, and methods in geography of land-surface system. Prereq: 3520 or consent of instructor. May be repeated with consent of instructor. A

5610 Topics in Climatology (3) Examination of trends, problems, and methods in modern climatology. Prereq: 3520 or consent of instructor. May be repeated with consent of instructor. A

5710 Seminar in Geography (3)

5720 Topics in Quantitative Geography (3) Multivariate analysis applied to problems in geography: research problems utilizing appropriate packaged computer programs; usefulness to geographic research of techniques developed by other disciplines. Prereq: 4100 or consent of instructor. Sp

5740 Advanced Topics in Remote Sensing (3) Applied research using remote sensing and aerial photographic imagery for interpretation and mapping of geographic data. Prereq: 4740 or consent of instruction. A

5790 Topics in Cartography (3) Trends, concepts, problems, and methods in cartography. Prereq: 3730, or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. A

5915 Regional Geomorphology (4) (Same as Geology 5915.)

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Seminar in Economic Geography (3, 3) A

6220-30 Seminar in Urban Geography (3, 3) A

6240-50 Seminar in Historical Geography (3, 3) A

6260-70 Seminar in Cultural Geography (3, 3) A

6310-20 Seminar in Rural Geography (3, 3) A

6410-20 Seminar in Regional Geography of the United States (3, 3) A

6510-20 Seminar in Regional Geography of Latin America (3, 3) A

6710-20 Seminar in Physical Geography (3, 3) A

NOTE: Registration in 6000-level courses may be repeated with consent of department.

Geological Sciences

MAJOR

Geology

DEGREES

M.S., Ph.D.

Professors:
K. R. Walker (Head), Ph.D.; D. Y. Hales, Ph.D.; J. Klepper (Emeriti), Ph.D.; D. O. Ohio State; O. C. Kopp, Ph.D.; D. Columbia; R. E. McLaughlin, Ph.D. Tennessee.

Associate Professors:
O. M. Clark, Ph.D. Pennsylvania State; K. C. Mira, Ph.D. Western Ontario.

Assistant Professors:

THE MASTER'S PROGRAM

The department requires a minimum of 45 quarter hours including at least 18 hours in courses (other than thesis) numbered above 5000. A minimum of 24 hours in geography courses, in addition to thesis, is required. Students who enter without having had an acceptable field camp are required to take Geology 4440, or an equivalent course elsewhere, as part of the above department requirements. One year of general physics is required, if not taken as an undergraduate. Thesis committee and topic must be approved by graduate program committee. Qualifying examination is given the second quarter.

THE DOCTORAL PROGRAM

Specific course program and thesis topic determined by candidate's faculty committee.

1. Program to be determined by faculty committee. Requirements include a minimum of 84 quarter hours in courses for graduate credit, in addition to dissertation. These courses must include a minimum of 45 hours in the 5000 or 6000 series, of which at least 15 hours must be in the 6000 series. Up to one-third of the required hours may be taken in related fields. A Master's degree is nec

2. Comprehensive examination will be both written and oral. The exam must be taken by the end of the second academic year.

3. Each Ph.D. student must satisfy a research tool requirement which will be determined by his/her faculty committee and which will consist of one of the following:

a. Demonstration by examination of a reading knowledge in one modern foreign language in which there is a significant body of geological literature.

b. Completion of course 3030 in an appropriate foreign language with a B or better.

c. Courses (minimum of 6 hours) at 3000 level or higher taken for undergraduate credit and completed with a B average in appropriate mathematics, statistics, or computer science courses. The courses must include at least 15 hours during a student's graduate program and must be approved by the student's entire committee.

In no case will option c above be available unless the student has had reading training as a college undergraduate in an appropriate foreign language.

• 3160 Introduction to Earth Materials (4) Study of minerals and rocks. Laboratory includes both hand specimen and analytical methods of identification. Prereq: 1410. 2 hrs and 2 labs.

• 3180 Mineralogy (4) Introduction to crystallography and study of mineralogy including hand specimen, chemical and x-ray methods of identification. Prereq: 1410. Chemistry 1110-20 or equivalent. 3 hrs and 1 lab. A

• 3210-20 Invertebrate Paleontology (4, 4) Systematic review of important Metazoan invertebrate fossil groups. 3210—Porteria to Annelida, including cidarisans, ectoprocts, brachiopods, and conodonts. 3220—Mollusca through lesser Chordata, including arthropods and echinoderms. May be taken separately or in sequence. Prereq: 3260; Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.

• 3260 Paleobiology (4) Introduction to principles and methods of paleontology as applied to interpretation of earth history. Prereq: 1420. 3 hrs and 1 lab or field period. A

• 3270 Geological History of Land Organisms (4) Geological history and development of terrestrial flora and ecosystem with special emphasis on fossil record of land plants and vertebrates. Prereq: Biology 1210-20 or consent of instructor. 3 hrs and 1 lab of field work.

• 3310 Introductory Petrology (4) Introduction to classification and properties of igneous and metamorphic rocks, processes which produce them, and tectonic environments in which they form. Laboratory emphasizes both hand specimen and microscopic study of important rock types. Prereq: 3160. 3 hrs and 1 lab. A
3330 Geology of East Tennessee (4) Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor.

3360 Stratigraphy-Sedimentation (4) Introductory study of stratigraphic principles and practices and of sedimentary processes and interpretation of depositional environments. Prereq: 1450 and 3160. 3 hrs and 1 lab period.

3370 Structural Geology (4) Introductory discussion of structural geology including folds, faults, joints, cleavage, and primary structures. Laboratory work includes depth and thickness problems, structure sections, structure contour maps. Prereq: 1420, Mathematics 1840-50 or equivalent. 3 hrs and 1 lab.

3410 Principles of Ground Water Geology (3) Geological materials and processes affecting the occurrence and behavior of water. 2 hrs and 1 lab.

3510 Introductory Environmental Geology (4) Geologic problems involving environmental and resources, and geologic parameters associated with their control and misuse. Prereq: 1402 or consent of instructor. 2 hrs and 2 labs or field periods.

3610 Quaternary Geology for Engineers (3) Erosional and depositional processes, landforms, ground water. Prereq: 2610 or equivalent. 2 hrs and 1 lab.

4110 Elements and Principles of Geology (4) Terms and origin of different types of mineral deposits, mathematical concepts. Prereq: 3180. 3 hrs and 1 lab.

4115 Elementary Applied Geophysics (4) Basic principles of electrical, seismic, gravity and magnetic surveying. Recommended: 1420, Physics 2260 or 2320. 3 hrs and 1 lab.

4130 Sedimentology (4) Introduction to physical processes of sedimentation: transport of sediments and formation of sedimentary structures, river flows, waves, tides, and ocean circulation. Prereq: 3110. 3 hrs and 1 lab.

4230 Paleocology (4) Principles of environmental analysis applied to fossil assemblages and associated lithologies. Prereq: 3260 or consent of instructor: 3 hrs and 1 lab.

4240 Paleobotany (4) Survey of fossil record of plants with particular emphasis on comparative morphology and evolutionary trends in major plant groups, and chronological succession and geographic distribution of past floras on earth. Prereq: 1420 or 2210; Botany 3010-20 or consent of instructor. 2 hrs and 2 labs.

4250 Evolution of Higher Taxa (4) Evolution of animal groups, and chronological succession of early vertebrate life and landforms produced. Prereq: 1410-20 or 30-30 or equivalent. (Same as Botany 4510) 3 hrs and 1 lab.

4270 Micropaleontology (3) Principles of paleoecology, paleoecological data. Prereq: 4510 or consent of instructor. 2 2-hr lectures per week.

4270 Tectonic Styles (4) Elements, habitats, and geotectonic causes of basic styles of tectonic deformation. How structures form, structural geology, and analysis applied to fossil assemblages and associated biological association if known. Special emphasis is given to geochemistry and paleomagnetism. Prereq: 4115, differential and integral calculus or consent of instructor. 12 hrs of geology and consent of instructor. 12 hrs of geology and consent of instructor.

4290 Quaternary Problems (4) Interdisciplinary approach to interpretation of physical and biological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of geology (3 quarter) or consent of instructor. (Same as Botany 5280 and Zoology 5290.)

4300 Geologic Photography, Photogrammetry and Remote Sensing (4) Terrestrial, airborne, and satellite geologic photogrammetry, photographic principles and practice, geometry of terrestrial and aerial photography, principles of nonphotographic remote sensing systems.

4510 Principles of Geomorphology (4) Gradational processes and behavior of landforms. Prereq: 1420, Botany 2010-20 or consent of instructor. 2 hrs and 1 quarter.

4520 Process Geomorphology (4) Gradational processes and behavior of landforms. Prereq: 1420, Botany 2010-20 or consent of instructor. 2 hrs and 1 quarter.

4550 Optical Mineralogy (4) Identification of minerals and determination of chemical parameters using petrographic microscope.

4620 Micropaleontology (4) Application of chemical principles to geologic problems. Emphasis on crystal chemistry and relation between basic atomic structure and distribution and behavior of elements in the earth's crust. Prereq: Chemistry 1110-20 or equivalent. Recommended: 3310.

4690 Mineral Phase Equilibria (4) Principles of phase chemistry and application of phase equilibria studies in rock-forming mineral systems as aid to understanding conditions of formation and modification of rocks. Prereq: 4610 or consent of instructor.


4770 Evolution of Oceans and Continents (4) Introduction study of origins and changes that have occurred in earth's crust with emphasis on major periods of continental drift and plate tectonics. Prereq: 1420.

4770 World Geology of Petroleum (4) Geologic habitat of petroleum deposits, methods of exploration and reserve assessment, geology and global distribution of known and potential reserves. Prereq: 1410 or equivalent and 3360 or equivalent.

4790 Uranium Deposits (4) Distribution, characteristics, and origin of different types of uranium deposits. Prospecting and evaluation of uranium deposits with special reference to domestic potential resources. Prereq: 4110 or consent of instructor. 3 2-hr lectures per week.

4810 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

5000 Thesis (1-15) E

5050 Geochemistry of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical, and theoretical considerations. Prereq: 4650 and 4110 or consent of instructor.

5069 Experimental Geochemistry Laboratory (1-3) Independent lab study of problem in geochemistry using lab techniques. Prereq: Consent of instructor.

5120 Geophysics—Gravity and Magnetic Methods (4) Potential methods, introduction to geodesy and paleomagnetism. Prereq: 4115, differential and integral calculus or consent of instructor. Advanced engineering mathematics desirable. 3 hrs and 1 lab.

5130 Geophysics—Seismic Exploration Methods (4) Seismic reflection and refraction methods, introduction to earthquake seismology and earth's interior. Prereq: 4115 or consent of instructor. 3 hrs and 1 lab.

5210-20-30 Special Problems in Geology (1-4, 1-4, 1-4)

5290 Quaternary Problems (4) Interdisciplinary approach to interpretation of physical and biological phenomena directly or indirectly influenced by Pleistocene glaciation. Prereq: Elements of geology (3 quarter) or consent of instructor. (Same as Botany 5280 and Zoology 5290.)

5310 Depositional Environments and Models for Exploration (4) Modern depositional environments and recognition of ancient analogs; topics application of the geologic environment and exploration geology.

5340 Seminar in Local Stratigraphy (1) Stratigraphy of Knoxville area.

5350 Selected Topics in Geology (1) Presentation of graduate research, topics from current literature, and subjects of general interest. Registration required each quarter except summer for resident full-time graduate students. S/N/C only.

5370 Mesofabric Analysis (4) Techniques of gathering, processing, and interpreting tectonic mesoscopic fabric data. Prereq: 3579. 3 hrs and 1 lab or field period.

5460 Photogeologic Interpretation (4) Advanced photogrammetric techniques to obtain geological information from aerial photographs. Practice in photo interpretation of covering selected geologic features. Prereq: Consent of instructor.

5470 Plate Tectonics and Orogeny (4) Geometry and kinematics of plate motion are used to devise models of geosynclines, fold belts, metamorphic and plutonic belts, with recent and ancient examples. Prereq: 3579. 3 hrs and 1 seminar or lab.

5520 Igneous Petrology (4) Genesis and emplacement of magma, and mineralogical, chemical, and textural properties of igneous rocks. Laboratory emphasizes petrographic description and classification of rocks in thin section. Prereq: 3310 and 4550. 2 hrs and 2 labs.

5530 Metamorphic Petrology (4) Physical and chemical characteristics of metamorphic environment, and effects on texture, chemical composition, and mineral equilibria. Laboratory emphasis petrographic description and interpretation of metamorphic rocks in thin section. Prereq: 3310 and 4550. 2 hrs and 2 labs.

5540 Terrigenous Clastic Sedimentary Petrology (4) Field and microscopic analysis of terrigenous clastic rock types, role of transport and depositional processes in affecting sediment texture and composition. Prereq: 3360 or equivalent. 3 hrs and 1 lab.

5550 Carbonate Sedimentology (4) Environments of deposition of modern and ancient carbonates.
5355 X-Ray Diffraction: Single Crystal Techniques (3) Prerequisite: Basic knowledge of crystallography and knowledge of chemical thermodynamics. Crystal symmetry and diffraction, reciprocal lattices, Ewald sphere constructions, space group determination and application to geological problems. Prerequisite: Knowledge of introductory crystallography and consent of instructor.

5840 Clay Mineralogy (4) Origin of clay minerals; structural and textural properties; application of mineralogical techniques in clay mineral studies. Prerequisite: 3180 and 5630 or equivalent. 2 hrs and 2 labs. To be offered on alternate-year basis.

5850 Thermodynamics for Geologists (3) Principles of chemical thermodynamics related to geological processes. Prerequisite: Chemistry 1110-20-30 and calculus of a single variable or equivalents.

5860 Cathodoluminescence Petrography (2) Application to geological problems. Prerequisite: 3180 and 4550 or consent of instructor. 1 hr and 1 lab.

5710 Advanced Paleontology (4) Fossil invertebrates.

5720 Paleontological Nomenclature and Techniques (4) Codification of biologic nomenclature as it affects petroleum exploration. Application of principles in preparation and illustration of paleontologic materials and manuscript preparation for publication. 3 hrs and 1 lab.


5820 Strata-bound and Stratiform Sulfide Deposits (3) Classification, distribution of mineral deposits related to genetic aspects of strata-bound and stratiform sulfide deposits. Mississippi Valley-type Pb-Zn deposits, strata-bound massive Cu-Zn-Pb deposits of volcanic and sedimentary associations, and stratiform Cu deposits. Prerequisite: 4110 or consent of instructor. 2 hrs and 2 lab-field seminar periods.

5830 Magmatic Mineral Deposits (4) Classification, distribution and characteristics of mineral deposits related to magmatic processes. Magmatic segregation deposits of ultramafic-mafic association and porphyry Cu-Mo deposits. Prerequisite: 4110 or consent of instructor. 2 hrs and 2 lab-field seminar periods.

5840 Ore Petrology (4) Ore mineral assemblages by reflected-light microscopy. Identification of ore minerals and interpretation of paragenesis from textural relationships. Prerequisite: 4130 or consent of instructor. Recomended: 4250 or equivalent or consent of instructor.

5850 Regional Studies in Geology (1-3) Literature study and seminars on specific regions of geological interest. A field trip may be arranged. Prerequisite: Consent of instructor.

5860 Coal Depositional Environments (4) Coal stratigraphy and depositional environments. Carboniferous rocks of Appalachian region, problems in coal mining and coal quality. Prerequisite: 3360 or 4130.

5915 Regional Geomorphology (4) Selected geomorphologically related areas, which have common elements such as history or development, related processes which have produced genetically similar assemblages of landforms. May be repeated with consent of department. (Same as Geography 5015.)

6000 Doctoral Research and Dissertation (3-5) E

*6110 Seminar in Stratigraphic Geology (3) *6110 Seminar in Geomorphology (3) *6810 Seminar in Geomorphology (3) Prerequisite: 4510 or consent of instructor. NOTE: Registration for 6000-level courses may be repeated with consent of department. Maximum 0 hrs per course.

**Germanic and Slavic Languages**

**MAJORS**

German Language and Literature

Emeritus Professors:

H. W. Fuller, Ph.D. Wisconsin; E. T. Hankamer, Ph.D. Born (Germany); R. L. W. Nordlieck, Ph.D. Ohio State.

Professors:

K. Kratz (Head), Ph.D. Ohio State; J. E. Feiden, Ph.D. Pennsylvania; R. L. Hiller, Ph.D. Cornell; J. C. Osborne, Ph.D. Northwestern; M. P. Rice, Ph.D. Vanderbilt.

Associate Professors:

U. J. Elliott, Ph.D. Michigan; D. M. Fane, Ph.D. Indiana; N. A. Lauckner, Ph.D. Wisconsin; D. E. Lee, Ph.D. Stanford; C. J. Meffer, Ph.D. Chicago.

Assistant Professor:

U. Riskenhoff, Ph.D. Connecticut.

The Department of German and Slavic Languages offers three advanced degrees. They are the Master of Arts (M.A.) in German, the Master of Arts in College Teaching (M.ACT) in German, and the Doctor of Philosophy (Ph.D.) in German Language and Literature.

THE MASTER'S PROGRAM

In addition to the general Graduate School requirements as stated on page 18, the department requires 36 quarter hours in approved courses, including at least 18 hours in courses numbered above 5000. In addition to coursework, the student is required to write a thesis, for which he/she may get a maximum of 9 hours credit. The minimum quarter hour credit for the M.A. is 45 quarter hours.

MASTER OF ARTS IN COLLEGE TEACHING PROGRAM

The MACT program is essentially an expanded M.A. program. The minimum requirement is 60 hours of graduate study, including 9 hours of thesis and a 3-quarter-hour seminar in college teaching. The aim of this program is to prepare highly qualified college teachers. Students receiving the MACT degree would be well prepared to go to the Ph.D.

THE DOCTORAL PROGRAM

The student must fulfill the general requirements for the Ph.D. degree set by the Graduate School. The candidate for the Doctoral degree must complete a minimum of 81 quarter hours of course work beyond the Bachelor's degree in addition to 36 hours of doctoral research and dissertation. At least 45 quarter hours of the minimum must be taken in 5000 or 6000 courses. Of these 45 hours, a minimum of 18 hours must be chosen from the proseminar (5200) and the literary or philological seminars (6210-20-30-40-50-60) and 6310-20-30 must be taken in a cognate field. Students are encouraged to take additional work in allied fields. A minor in an allied field must consist of at least 18 hours of 5000 or 6000 courses. Students must show a fluent command of German, both oral and written, and a knowledge of two foreign languages, French and another language, such as Italian, Latin or Russian, appropriate to the field of research. A comprehensive examination, both written and oral, on German language and literature and the minor field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

The field of study is divided into (1) German literature and (2) German (or Germanic) philology or linguistics. A student may concentrate on one or the other. Dissertation and seminar research topics will be chosen in accordance with the varying preferences and specific interests of the faculty. Detailed programs will be established in each case by the student's faculty committee.

3010-20-30 Elements of German for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examination, and to upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for students having completed elementary German.

3210-20-30 German Literature in English Translation (3-4, 3-4, 3-4) No foreign language credit. No change in credit hours after add deadline. Students opting for 4 hrs credit will be expected to present an appropriate amount of extra work above that required for 3 hrs. F, W, Sp

3240 Old Norse Literature in English Translation (3-4) Prose readings of sagas of Norwegian kings, great Icelandic family sagas, and Viking sagas, narrating discovery of America around year 1000. Mythological and heroic poems of the Edda.

4110-20-30 Studies in Classical and Modern Writers (3, 3) Prerequisite: 6210-20-30-40-50-60 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. May be repeated with consent of department.

4140-60 Selected Topics in German Literature from 1750 to the Present (3, 3) Prerequisite: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation) or equivalent. Su

4160 Studies in German Authors (3) Life and works of a single outstanding German literary figure. Content varies. Prerequisite: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English translation). May be repeated. Su

4170 Theatrical German (1-3) Performance in one or more German plays. Prerequisite: Intermediate German or equivalent or consent of instructor. May be repeated with consent of department. W, Sp

4210-20-30 Studies in German Literary Types (3, 3, 3) Prerequisite: 3010-20-30-40-50-60-4250; Narrative prose. Prerequisite: 9 hrs of 3000 courses (exclusive of 3010-20-30, 3210-20-30, 3310) or equivalent. F

4250 Introduction to Descriptive Linguistics (3) Same as French, Russian, Spanish, and Linguistics 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) Linguistic change, protolanguages. Phonological and morphological change. Cultural, historical, sociological influences upon the development of language. Semantics. Lexicography.
or consent of department. F; W; Sp

3810-30-40 German Language and Civilization (3, 3, 3) Prereq: 3810-20-30 or equivalent.

4210-30-40-50-60 Seminar in German Literature (3, 3, 3, 3, 3) May be repeated. E

5200 Proseminar (3) Bibliography: methods; illustrative problems; preparation of papers. F

5210-20-30 College Teaching of German (1, 1, 1) Prereq: 5200 or equivalent. Except those whose previous teaching experience warrants excuse from this requirement or who wish to pursue vocations other than teaching. F; W; Sp

5410-20-30 Medieval German Language and Literature (3, 3, 3) S410—Introduction to Middle High German. 5420-30—Readings in Medieval German Language. F; W; Sp

5500 Studies in German Literature (3) Content varies. May be repeated. Maximum 9 hrs. Su

5510 Foreign Study (1-12) See page 97. E

5520 Study Abroad (1-12) See page 97. E

5530 The Enlightenment and the Rococo (3)

5540 German Classicism (3)

5550 Goethe's Faust (3)

5560 German Romanticism (3)

5570 German Realism and Naturalism (3)

5580 Modern German Literature (1889-1945) (3)

5590 Modern German Literature (1945-Present) (3)

5600 German Literary Theory and Criticism (3) W

5610-20-30-40-50-60 Directed Readings in German Language and Literature (3, 3, 3, 3, 3, 3) S410—Introduction to Middle High German; 5420-30—Readings in Medieval German Language. F; W; Sp

5700 Selected Topics in Russian and East European Studies (3) Interdisciplinary seminar on selected topic using comparative approach.

5710 Introduction to Old Norse (3) Phonology, morphology and syntax of Old Norse. Representative readings. F

5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. Icelandic saga as literary genre.

5730 Readings in Old Norse Poetry (3) Intensive reading of Edic poems as a literary genre and re-pository of ancient Germanic customs, legends, and mythology.

6000 Doctoral Research and Dissertation (3-15) E

6100 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible.


6140 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings.

6210-20-30-40-50-60 Seminar in German Literature (3, 3, 3, 3, 3, 3) May be repeated. E

6310-20 Seminar in German and Germanic Philology (3, 3, 3) May be repeated. E

Russian

3010-20-30 Elements of Russian for Graduate Students and Seniors (3, 3, 3) For graduate students preparing for language examinations and seniors desiring reading knowledge of a second foreign language. Prereq: 2 years of some foreign language in college or consent of department. Undergraduate credit only. No credit for students having completed 1 yr of Elementary Russian.

3210 Nineteenth-century Russian Literature in English Translation (3-4) War and Peace, Anna Karenina, and other works.

3220 Works of Leo Tolstoy in English Translation (3-4) Crime and Punishment, Brothers Karamazov and other works.

3230 Twentieth-century Russian Literature in English Translation (3-4) Russian modernism and literature under the soviets.

3240 The Russian Drama in English Translation (3-4) Selections from works of Chekhov, Gogol, Ostrovsky, Turgenev, and others.

3250 The Works of Ivan Turgenev and Anton Chekhov in English Translation (3-4)

3260 Russian Folklore in English Translation (3-4)

3270 Russian Philosophical and Theological Thought (4) A survey of the development of philosophical and theological thought in Russia from the Middle Ages to the Revolution. Special emphasis on the expression of this thought in Russian literature and literary criticism. No knowledge of Russian required. (Same as Philosophy 3270 and Religious Studies 3270.)

4010 Selected Topics in Russian and East European Studies (3) Interdisciplinary seminar on selected topic using comparative approach.


4250 Introduction to Descriptive Linguistics (3) (Same as French, Spanish, Linguistics, and German 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) (Same as French, German, Spanish, and Linguistics 4260.) W

4271 Introduction to Slavic Linguistics (3) (Same as Linguistics 4271.)

4310-30 Advanced Studies in Russian Language and Literature (3, 3, 3) Intended primarily for students majoring or minoring in Russian who are interested in language and linguistics. Includes problems in morphology and syntax, stylistics and translation techniques, and history of Russian language as well as other special problems for advanced students of Russian. May be repeated. Maximum 9 hrs each.

4410-20-30 Directed Readings in Russian (3, 3, 3)
II. Early Modern

Both.

The four areas listed below must be worked outside the History Department. Three of the four fields, distributed as follows: one major field (history); two minor fields (history); and one language requirements fulfilled, and at least one quarter.

Committee: Incoming students will be advised by the department head. The committee may accept in place of a language a B or better performance in an appropriate statistical course or History 3290.

Foreign language requirements may be satisfied in one of two ways:

(a) 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.

(b) By course work. Upon consultation with the advisor, a student may elect to complete an appropriate 3010-20-30 sequence in a language department (or an intermediate sequence in a language in which no 3010-20-30 sequence is available.)

Satisfactory completion requires that a student must have at least a B in the final quarter.

4. Comprehensive Examination and Committee: Incoming students will be advised by the department head.

The comprehensive examination 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 ninth quarter of work toward the doctorate. The candidate must present four fields, distributed as follows: one major field (history); two minor fields (history); and one minor field which may be either in history or outside the department. In any case, the student is required to have 9 hours of graduate work outside the History Department. Three of the four areas listed below must be represented by a major or a minor field, or both.

I. Ancient and Medieval

(1) Ancient Near East
(2) Greece
(3) Rome
(4) Early Middle Ages, 375-1122
(5) Late Middle Ages, 1095-1450

II. Early Modern

(1) Renaissance and Reformation
(2) Europe, 1559-1815
(3) American History to 1815
(4) Latin America, 1492-1825

III. Modern

(1) Europe, 1815-1914
(2) European World Since 1914
(3) United States, 1815-present
(4) Latin America, 1789-present
(5) East Asia, 1641-present
(6) Middle East, 1798-present

IV. National, Sectional and Topical

(1) England, 1485-1763
(2) Great Britain, 1760-present
(3) France, 1559-1815
(4) France, 1789-present
(5) Germany, 1550-1806
(6) Germany, 1806-present
(7) Russia, 1600-1800
(8) Russia, 1800-present

9. Colonialism and Imperialism

(10) Diplomatic History of the States

(11) Social and Cultural History of the United States

(12) The South

(13) Frontier and Western Movement

(14) Afro-American

The comprehensive examination will be both written and oral.

5. 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.

3060-70 History of Western Religious Thought and Institutions (3, 3, 3) (Same as Religious Studies 3060-70.)

3140-50 History of England (3, 3, 3) 3140-To 1688. 3150-1669 through the Reform Bill of 1832. 3160-1832 to the present.

3211-21 History of Tennessee (3, 3) 3311-Eighteenth Century to Civil War Era. 3321-1865 to present.

3411-12 The Reformation (3, 3) 3411-Renaissance. 3412-Reformation, Counter Reformation, and Wars of Religion, 1517-1618. (Same as Religious Studies 3411-12.)

3421-22-23 Early Modern Europe 1600-1815 (3, 3, 3) 3421-Seventeenth-century Europe. 3422- Ancient Regime. 3423-French Revolution and Napoleon.


4446 History of France (4, 4) 4450-To 1785. 4460-Since 1781.

4470-90 History of Russia (3, 3, 3) 4470-To 1801. 4480-Nineteenth Century. 4490-Twentieth Century.

3060-10 The American Colonies and the American Revolution (3, 3) 3610-Settlements to 1754. 3620-1754-1789.


3710-20-30 History of Germany (3, 3, 3) 3710—First Reich to 1713. 3720-Habsburg and Hohenzollern and Formation of Second Reich, 1713-1890. 3730-From a unified to a divided Germany, 1890 to present.

3740-50 The City in Europe, ca. 1200-1900 (3) Survey of European urban growth, with comparative analysis of the major periods of urbanization of the thirteenth and nineteenth centuries. Emphasis on the relationship between demographic, economic and social foundations of cities and political and cultural development.

3751-52 Ancient Near Eastern Civilization (3, 3) 3751-Early and Middle Bronze Ages. 3752-Late Bronze and Iron Ages.

3760-70 The Ancient World (3, 3) 3760-Greece, Rome.
5216, American History Since 1789; 5217, Latin America; 5218, Far East; 5219, Colonialism and Imperialism; 5221, England; 5222, Russia; 5223, Germany; 5224, France; 5225, Middle East. Open only to Master’s candidates in history. S/NC only. E
5240 Introduction to Historical Research (3) Principles and techniques of research in the study of history. Required of all candidates for advanced degrees who do not present evidence of similar training elsewhere. F
5250 European Historiography (3) Introduces the student to the historical literature of leading European nations. W
5260 American Historiography (3) Like 5250 in the American field. W
5271-72-73 The Teaching of College History (0, 0, 3) Introduction to problems of teaching at college level. Place of history in curriculum, types and levels of courses, and techniques of teaching. Prereq: Consent of instructor. Required of candidates for the MACT. Credit will be withheld until the completion of 5273, with grades of "S" or "NC" submitted at end of each of first two quarters. E
5280 Philosophy and Methodology (3) Philosophies of history and their relationship to modern trends in historical methodology. G
5290 Quantitative Analysis of Historical Data (3) Prereq: Sociology 5280 and 5350, or consent of instructor. Sp
5300 Topics In History (3)
5310 Topics In Women’s History (3)
5320 Topics In Historical Editing (3) Principles and practice of editing documents.
5360 Topics in American Foreign Relations (3)
5410 Topics in Early Modern European History (3)
5440 Revolution and Restoration In Central Europe, 1780-1850 (3) Reform, resistance, and the advent of Liberalism and Nationalism.
5444 Topics In French History (3)
5445 Topics In Nineteenth-century European History (3)
5450 Topics In Twentieth-century European History (3)
5480 Topics in Russian History (3)
5510 Topics in Tudor-Stuart England (3)
5520 Topics in Modern English History (3)
5550 Reaction and Reform in England, 1789-1848 (3)
5560 Anglo-Irish Relations (3)
5560 Topics In American Social and Cultural History (3)
5645 Topics in American Urban History (3)
5650 Topics in the American Westward Movement (3)
5660 Topics in Negro History (3)
5670 Topics in American Colonial History (3)
5675 Topics in the Early National Period of American History (3)
5680 Topics In Nineteenth-century American History (3)
5690 Topics In Twentieth-century American History (3)
5720 Topics in Medieval History (3)
5740 Topics In European Urban History (3)
5750 Topics In Ancient History (3)
5780 Topics in German National Socialism (3)
5790 Topics in Middle Eastern History (3)
5810 Topics In Andean History (3)
5820 Topics In Mexican History (3)
5850 Topics In Chinese History (3)
5860 Topics In Japanese History (3)
5910-20 Topics In Southern History (3, 3) 5910—Old South. 5920—New South.
6000 Doctoral Research and Dissertation (3-15) E
6210-20-30-40 Directed Readings (3, 3, 3, 3) Individual readings directed toward preparation for preliminary examination fields. Open only to candidates for Ph.D. degree who are in residence and who have been in residence at least two quarters. Only one course may be taken in preparation for each of four fields. Depending on field in which he/she is reading, student will be assigned to appropriate member of department. S/NC only. E
6300 Seminar In Special Studies (3)
6310 Seminar In Tennessee History (3)
6350 Seminar In American Diplomatic History (3)
6410 Seminar In Western Europe (3)
6444 Seminar In French History (3)
6480 Seminar In Russian History (3)
6510 Seminar In English History (3)
6510 Seminar In American Colonial History (3)
6620 Seminar In the Era of the American Revolution (3)
6630 Seminar In Early National Period of American History (3)
6650 Seminar In the American Westward Movement (3)
6710 Seminar In Medieval institutions (3)
6770 Seminar In Central European History (3)
6810 Seminar In Latin American History (3)
6910 Seminar In the Civil War Era (3)
6930 Seminar In Twentieth-century America (3)
6940 Seminar In the History of the South (3)

NOTE: Registration in topics and seminar courses may be repeated for credit with consent of department.

Latin

See Classics

Mathematics

MAJOR
Mathematics

DEGREES

Mathematics

M.M., M.A., M.S., Ph.D.

Professors:

G. E. Albert (Emeritus), Ph.D. Wisconsin; J. S. Bradley (Head), Ph.D. Iowa; J. H. Carruth, Ph.D. Louisiana State; R. E. Cline, Ph.D. Purdue; R. J. Davenport, Ph.D. Wisconsin; D. J. Desart, Ph.D. Maryland; D. E. Dobbs, Ph.D. Cornell; E. D. Eaves (Emeritus), Ph.D. Texas; H. Frandsen, Ph.D. Illinois, D. A. Gardner, Ph.D. North Carolina State; R. T. Gregory, Ph.D. Illinois; M. D. Gunzburger, Ph.D. New York; G. Hallam, Ph.D. Missouri; D. B. Norten, Ph.D. Tennessee; A. S. Householder (Emeritus), Ph.D. Chicago; L. R. Husch, Ph.D. Florida State; R. M. McDonnell, Ph.D. Duke; H. T. Mathews, Ph.D. Tulane; D. D. Miller (Emeritus), Ph.D. Michigan; B. S. Rajput, Ph.D. Illinois; K. C. Reddy, Ph.D.
The Masters of Mathematics degree 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 of the states of the United States, or (b) three years of successful elementary or secondary school teaching experience. Evidence of the requirement being met must be supplied by the student.

Applicants for admission to this program must take the Graduate Record Examination (aptitude portion), and have had at least one year of college mathematics including analytic geometry.

The following requirements must be met:

1. Completing 45 hours of course work, of which at least 9 must be at the 5000 level. The course work must include:
   a. 36 hours of mathematics courses numbered 3050 or above;
   b. 9 hours of additional work from mathematics courses numbered 3050 or above or from courses in other departments selected in consultation with the advisor.

2. Passing a comprehensive examination upon completion of all course work.

The Master of Arts degree and the Master of Science degree are designed to prepare students for industrial employment and for teaching at the high school and junior college level.

The department offers two options for these degrees. The first option requires a thesis for which 9 hours must be earned along with 36 additional hours of work in acceptable courses numbered above 4000. Of the additional hours, 9 may be in an area outside the department and 18 must be in courses in mathematics numbered above 5000.

After two quarters of graduate study, a student whose supervisory committee grants its approval may choose the non-thesis option, for which 45 hours of work in courses numbered above 4000 are required. Of these, 27 hours (at least 24 of which are in mathematics) must be in courses numbered above 5000. Of the 45 hours, 15 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 comprehensive examination be passed, and that credit be received for a 3-hour seminar or reading course (5990-5995) 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 9 hours of resident graduate credit in courses numbered above 4000 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 departmental requirements:

1. Pass written examinations covering four subjects, at least three of which must be from the following list:
   a. Algebra 5510-20-30
   b. Functions of a Complex Variable 5110-20-30
   c. Topology 5910-20-30
   d. Functions of a Real Variable 5210-20-30
   e. Linear Analysis 5250-60
   f. Partial Differential Equations 5450-60-70
   g. Ordinary Differential Equations 5870-80-90
   h. Numerical Mathematics 5655-65-75
   i. Mathematical Statistics 5750-60-70
   j. Fluids, Elasticity, Mathematical Ecology

2. An introduction to abstract algebra, beginning with study of integers followed by more general sets and relations. Prereq: 1550-60 or equivalent. W, Sp

3. A one-year, 6000-level reading course (5990-5995) in which a term paper or project is required.

4. A student selecting only three from the above list will also be required to pass a written examination in 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 faculty whose responsibility is to submit a list of topics and references through the Graduate Committee to the Applied Mathematics Committee for its approval.

A student may take as many of the 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 4-fail 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 four times, but no one failing five exams, counting possible repetitions, will be permitted to take another course of exams.

2. Pass an intensive exam in the field of specialization. This exam will be given by a committee appointed by the department head at some time after the requirements in 1. have been met. A student may take this specialty exam only twice.

3. The conditions for the doctoral degree are to include a demonstrated 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.

In addition, the department requires that each student take a one-year, 6000-level course in mathematics outside of his/her area of concentration. The use of the course selected to fulfill this requirement must be approved by the department head and the student's Doctoral Committee. (Such approval may occur after completion of the course.)

The written exams mentioned in 1. are normally given twice each year, once in the fall and once in the winter. The fall exams usually are given before the fall quarter begins, and the winter exams are given early in January.

These courses are sometimes offered in special summer institutes for an 8-week period with 4 hrs credit. Such special courses are designed 3651, 3651, etc.
variants. Must be taken in sequence. Prereq: 3810, homeomorphisms, continua, and topological in-
Topics will include topology of line and plane, and eigenvectors, similarity and unitary transforma-
requirements of major or minor in mathematics. Pre-
include certain standard topics such as elementary
method of approximating roots, and formulas for
mathematical modeling techniques applied to biological phenomena. Does not satisfy
4050-60 Matrix Algebra and Applications (3) Vector spaces, linear transformations, eigenvalues and
equations, application to problems in engineer-
4550-60-70 Introduction to Mathematical Statis-
tics (3, 3, 3) Introduction to probability; discrete and continuous random variables, regression; hypothesis testing; independence: foundations of sampling theory. Must be taken in sequ-
4710 Vector Analysis (3) Fundamental operations, basis vectors, dot and cross products, directional der-
atives, divergence and curl of vector fields, line and surface integrals, Green's theorem, and Stokes' theorem. Does not satisfy requirements of major or minor in mathematics. Prereq: 2860. E.
4750-60-70 Introductory Probability Theory (3, 3, 3) Elementary combinatorial analysis, prob-
bilities in discrete sample spaces, conditional prob-
ity and stochastic independence, binomial, Pois-
son, hypergeometric and normal distributions. 4760—Expectation, conditional expectation and characteristic function of random variables, infinite sequences of random variables, the weak and strong
4810 Elementary Number Theory (3) Divisibility, congruences (equivalence of integers), prime num-
ber; indices, quadratic reciprocity. Prereq: 2860 or consent of instructor. Su.
4980 Readings in Mathematics (1-3) Open to su-
pers students with consent of department head. In-
dependent study with faculty guidance. May be re-
peated. Maximum 9 hrs.
4990 Studies in Mathematics (1-4) Credit deter-
rmined at registration. Prereq: Recommendation of Mathematics Department faculty member and con-
sent of department. May be repeated. Maximum 9 hrs.
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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. **
5011 Elementary Functions from an Advanced Standpoint for Teachers (3-4) Order and complete-
ness axioms of real numbers; limits of sequences, derivatives of functions; definitions and properties of exponential, logarithmic and trigonometric functions; infinite series; convergence; Taylor's and Mac-
laurin's series; applications; applications of algebraic and trigonometric tables. Prereq: 3150 or 3110 or consent of instructor.
5012 Differential Geometry for Teachers (3-4) Primarily for high school geometry of high level. Historical and modern presentations of topics encountered in a high school geometry class: axioms, synthetic and metrical; betweenness of segments and triangles; parallel postulate; similarity, area; ruler and compass constructions; Klein's Euclidean plane. Prereq: 4710 and one 4000-level mathematics course recommended.
5014 Analysis for Teachers (3-4) Functions of several variables, vectors, limits and continuity, par-
tial derivatives, directional derivatives and gradient, implicit function theorem, maxima and minima, dif-
finitions, characteristic function of random variables, the weak and strong
5015 Probability and Statistical Inference for
5370-80-99 Mathematical Principles of Fluid Mechanics (3, 3, 3) Equations of motion, incompressible flows, compressible perfect gas, shock waves in perfect fluids, viscous flows and boundary layer phenomena, additional special topics. Prerequisites: 4530 or 4710 or consent of instructor.

5430 Integral Equations (3) Solution of integral equations by methods of Fredholm, Volterra, and Hilbert. Prerequisite: 5410-20.


5450-80-70 Introduction to Partial Differential Equations (3, 3, 3) Linear second-order equations in two variables; properties of elliptic, hyperbolic and parabolic equations, separation of variables, and Fourier series. Nonhomogeneous problems, problems in higher dimensions, multiple Fourier series, Fourier and Laplace transforms. Prerequisites: 4510-20 and 4610.

5455 Finite Difference Methods for Partial Differential Equations (3) Finite difference techniques for solution of parabolic, elliptic, and hyperbolic equations. Consistency, stability, convergence, nonlinear problems; curved boundaries; solution of linear systems.

5460-90 Mathematical Programming (3, 3) Optimization methods, further study of finite difference methods, constrained and unconstrained optimization, linear and non-linear least squares problems. Systems of nonlinear equations and nonlinear least squares problem. Prerequisite: 4610, 4050, 4510-20-30.}

5510 Foundations of Analysis (3) Development of integral, rational, real, and complex number system from Peano axioms. Prerequisite: 4510-20.

5520 Functions of a Complex Variable (3, 3, 3) Complex numbers; infinite series; fundamental theorem, Cauchy-Riemann equations; integration by parts, Simpson’s rule, improper integrals, applications, functions of complex variable and recursion theory; consistency, completeness, decidability.

5540 Galois Theory (3) Fields and their extensions, Galois theory, finite fields, applications to physics; extension to n-dimensional space. Prerequisite: 5410-20. Must be taken in sequence. F, W, Sp, A.


5560-55-75 Numerical Mathematics (3, 3, 3) Analytical approach to discrete and continuous dynamical systems, fundamentals of control theory, linear problems, linear perturbation theory, nonlinear analysis, sensitivity and stability aspects, applications to ecological systems, role of dynamical systems in ecological modeling, optimal control problems. Prerequisites: 4610, 4050, 4510 or consent of instructor. F, W, Sp, A.
**Microbiology**

**MAJOR**

**Microbiology**  
M.S., Ph.D.

Professors:  
- A. Brown (Head), Ph.D. Chicago; R. W. Beck, Ph.D.  
- A. S. M. Becker, Ph.D. Wisconsin; J. M. Becker, Ph.D. Cincinnati  
- R. J. Courtney, Ph.D. Syracuse; T. C. Montie, Ph.D.  
- A. L. Johnson, Ph.D. Michigan State  
- W. S. Riggio, Ph.D. Yale; B. T. Rouse, Ph.D.  
- G. G. Guef, Ph.D. Canada; J. M. Woodward  
- F. A. Mercier, Ph.D. Emeritus; D. A. Streeck, Ph.D. Indiana  

**DEGREES**

Students planning to major in Microbiology are expected to present, as undergraduate prerequisites, a minimum of one year of biology, one year of mathematics including calculus, two years of chemistry and one year of physics.

The student's dissertation committee determines whether a foreign language is required for the doctoral degree.

**THEORETICAL COURSES**

- **3810 Food Bacteriology (3)** Standard methods for examination, cultivation, and identification of bacteria associated with food fermentation and food spoilage. Prereq: 2910 or 3700 and Chemistry 2230 or 3211. Sp.
- **3820 Yeast and Molds (3)** Morphology, taxonomy, and physiology of yeasts, actinomycetes, and fungi of industrial importance. Prereq: 2910 or 3700. or consent of instructor. W.
- **3829 Yeasts and Molds Laboratory (2)** Laboratory methods for examination and cultivation of yeasts and molds. Prereq: 2919 or 3519. Coreq: 3820. W.
- **4110 Physiology of Bacteria (3)** Modern concepts of bacterial physiology and metabolism including cell structures and function. Prereq: 3700 and 12 hrs of organic chemistry. W.
- **4119 Bacterial Physiology Laboratory (2)** Prereq: 3519. Coreq: 4110. W.
- **4130 Taxonomy of Bacteria (3)** Bacterial classification. Prereq: 3700 and 3519. F.
- **4140 Molecular Genetics (3)** Transmission and expression of genetic information at the molecular level. Emphasis is on bacterial and viral systems, but unique features of eukaryotic genetic systems are included. Prereq: 3700 or consent of instructor. Sp.
- **4149 Techniques in Microbial Genetics (2)** Practical exercise in basic techniques in experimentation in microbial genetics. Coreq: 4140. Sp.
- **4150 Microbial Ecology (3)** Application of ecological principles to study of microbial communities. Emphasis on functional role of microorganisms in natural environments. Prereq: 3700, 1 yr of organic chemistry, Biology 3130, or consent of instructor. Sp.
- **4159 Experimental Microbial Ecology (3)** Survey of techniques for assessment of microbial forms, functions, activities, and interactions in a variety of habitats. Prereq: 3519. Coreq: 4150 or consent of instructor. 1 hr and 2 labs. Sp.
- **4270 Immunology (3)** Principles of inflammation and immunity, immunoglobulin structure and theories of formation, complement, hypersensitivities, cell cooperation in immune mechanisms, abnormalities of the immune system. Prereq: Biology 3130. (Same as Zoology 4270.) F.
- **4279 Advanced Immunology Laboratory (2)** Laboratory exercises designed to accompany 4270. Prereq or coreq: 4270. F.
- **4320 Pathogenic Bacteriology (3)** Disease-producing microorganisms, disease bacteria, rickettsia, and chlamydia. Prereq: 3200. W.
- **4330 Medical Mycology (3)** Disease-causing fungi; cytology, physiology, pathogenesis and immunity; emphasis on methodology of isolation and identification. Prereq: 3700. Sp.
- **4420 Molecular Virology (3)** Molecular aspects of the replication, assembly and expression of viruses, with emphasis on bacteriophage. Prereq: 3700. F.
- **4430 Medical Virology (3)** General virology with emphasis on medical aspects. Prereq: 3200. W.
- **4439 Medical Virology Laboratory (2)** Laboratory procedures for isolation, handling and culturing of animal viruses. Prereq: 3519. Coreq: 4430. W.
- **5000 Thesis (1-5 E)**
- **5002 Non-Thesis Graduation Completion (3-15)** Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree requirements. May not be used toward degree requirements. May be repeated. S/N/NC only. E.
- **5011-12-13-14-15-16 Mini-course in Microbiology (1, 1, 1, 1, 1, 1)** Selected, advanced topics in microbiology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: as posted. May be repeated. Maximum 9 hrs. S/N/NC only.
- **5130 Topics in Virology (3)** Isolation, cultivation and taxonomic relationships of microorganisms, emphasis upon less frequently encountered orders. Prereq: 4130. labs.
- **5310 Selected Topics in Microbiological Research (2-5)** Literature surveys and laboratory methods for development and interpretation of microbiological research. May be repeated.
- **5350 Advanced Microbiology for Secondary Education Instructors (5)** Emphasis on microbial populations encountered in natural habitats; laboratory methods for isolation and characterization of natural occurring microorganisms. Prereq: Consent of instructor and introductory course in microbiology and general chemistry. Not for degree credit in microbiology. Su.
- **5360 Topics in Immunology and Immunochemistry (4)** Molecular and genetic aspects of immunoglobulin synthesis. Theoretical and practical exercise in immunochemistry. Prereq: 4270, Biochemistry 4110-20 or equivalent.

**LABORATORY COURSES**

- **4159 Experimental Microbial Ecology (3)** Survey of techniques for assessment of microbial forms, functions, activities, and interactions in a variety of habitats. Prereq: 3519. Coreq: 4150 or consent of instructor. 1 hr and 2 labs. Sp.
- **4270 Immunology (3)** Principles of inflammation and immunity, immunoglobulin structure and theories of formation, complement, hypersensitivities, cell cooperation in immune mechanisms, abnormalities of the immune system. Prereq: Biology 3130. (Same as Zoology 4270.) F.
- **4279 Advanced Immunology Laboratory (2)** Laboratory exercises designed to accompany 4270. Prereq or coreq: 4270. F.
- **4320 Pathogenic Bacteriology (3)** Disease-producing microorganisms, disease bacteria, rickettsia, and chlamydia. Prereq: 3200. W.
- **4330 Medical Mycology (3)** Disease-causing fungi; cytology, physiology, pathogenesis and immunity; emphasis on methodology of isolation and identification. Prereq: 3700. Sp.
- **4420 Molecular Virology (3)** Molecular aspects of the replication, assembly and expression of viruses, with emphasis on bacteriophage. Prereq: 3700. F.
- **4430 Medical Virology (3)** General virology with emphasis on medical aspects. Prereq: 3200. W.
- **4439 Medical Virology Laboratory (2)** Laboratory procedures for isolation, handling and culturing of animal viruses. Prereq: 3519. Coreq: 4430. W.
- **5000 Thesis (1-5 E)**
- **5002 Non-Thesis Graduation Completion (3-15)** Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree requirements. May not be used toward degree requirements. May be repeated. S/N/NC only. E.
- **5011-12-13-14-15-16 Mini-course in Microbiology (1, 1, 1, 1, 1, 1)** Selected, advanced topics in microbiology, concentrated in time and subject matter. Consult departmental listing for topics offered. Prereq: as posted. May be repeated. Maximum 9 hrs. S/N/NC only.
- **5130 Topics in Virology (3)** Isolation, cultivation and taxonomic relationships of microorganisms, emphasis upon less frequently encountered orders. Prereq: 4130. labs.
- **5310 Selected Topics in Microbiological Research (2-5)** Literature surveys and laboratory methods for development and interpretation of microbiological research. May be repeated.
- **5350 Advanced Microbiology for Secondary Education Instructors (5)** Emphasis on microbial populations encountered in natural habitats; laboratory methods for isolation and characterization of natural occurring microorganisms. Prereq: Consent of instructor and introductory course in microbiology and general chemistry. Not for degree credit in microbiology. Su.
- **5360 Topics in Immunology and Immunochemistry (4)** Molecular and genetic aspects of immunoglobulin synthesis. Theoretical and practical exercise in immunochemistry. Prereq: 4270, Biochemistry 4110-20 or equivalent.

**NOTE:** Registration for 6000-level courses may be repeated with consent of department.
Music

MAJOR

Music

DEGREES

M.M., M.A.

Professors:


Associate Professors:


Reading,

Discussions, and


5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetics concepts (mutation, complementation, recombination) at molecular level. Studies of lactase operon of Escherica coli. Prereq: 4140 and Biochemistry 4110-20 or consent of instructor.

5820 Microbiology of Foods (3) Lectures and seminars dealing with current advances and selected topics in food microbiology with emphasis on analytical methods, safety and preservation. Prereq: 3810; Biochemistry 4110-20. Recommended prereq: Food Technology 4920.

5850 Seminar in History of Microbiology (1) Microbiologists and their achievements from Pasteur to present. S/NC only.

5910-20-30 General Seminar (1, 1, 1) Reviews of current literature. May be repeated with consent of department. S/NC only. E

6000 Doctoral Research and Dissertation (3-15) E

6310 Seminar in Immunology (1) Readings and discussions based on current literature. May be repeated. S/NC only. F, W, Sp

6320 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6330 Seminar in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6340 Seminar in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6350 Seminar in Virology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6360 Seminar in Filamentous Fungi (1) Readings and discussions based on current literature. May be repeated. Maximum 9 hrs. S/NC only. F, W, Sp

6370 Current Topics in Environmental Microbiology (2) Readings, discussions, and critical evaluation of current literature. May be repeated. Maximum 8 hrs. S/NC only. F

6410 Concepts of Immunity (3) Discussion and readings of recent advances in immunobiology and immunopathobiology.

6420 Current Topics in Biological Membrane Research (1) (Same as Biochemistry 6420.)

6720 Advanced Topics in Microbial Physiology (3) Prereq: 5720. May be repeated with consent of department.

6730 Advanced Topics in Microbial Pathogenesis (3) Prereq: 5730. May be repeated with consent of department.

6740 Advanced Topics in Virology (3) Prereq: 4420 or 4430. May be repeated with consent of department.

6760 Advanced Topics in Microbial Genetics (3) Prereq: 6340. May be repeated with consent of department. S/NC only.

6810-20-30 Problem Seminar (1, 1, 1) Research problems and methods, critical analysis of experimental data and validity of conclusions. May be repeated with consent of department. S/NC only.
elemental writing with emphasis on scoring for the concert orchestra. Prereq: 3112 or consent of instructor.

3230 The Concerto (3) Survey of literature from seventeenth century to present.

3240 The Symphony (3) Survey of symphonic literature from precursors of classical symphony to present.

3260 Chamber Music (3) Survey of chamber music from 1750 to present.

3271-81 History of Opera (3, 3) Dramatic, vocal and orchestral elements in opera of Italian, French, and German School. 3271—1600-1800; 3281—1800 to present.

3340 Oratorio (3) Choral works other than those appropriate for use in church.

3500 Flute (1-4)

3505 Oboe (1-4)

3510 Bassoon (1-4)

3515 Clarinet (1-4)

3520 Saxophone (1-4)

3525 Horn (1-4)

3530 Trumpet (1-4)

3535 Trombone (1-4)

3540 Baritone (1-4)

3545 Tuba (1-4)

3550 Percussion (1-4)

3555 Violin (1-4)

3560 Viola (1-4)

3565 Cello (1-4)

3570 String Bass (1-4)

3580 Piano (1-4)

3585 Harpsichord (1-4)

3590 Organ (1-4)

3595 Guitar (1-4)

3597 Composition with Electronic Media (1-3) Prereq: Consent of instructor.

3599 Composition (1-3) Prereq: Consent of instructor.

3590 Evolution of Jazz (3) Study of origin, development and styles of jazz music and its exponents.

4003-05 The Organ and Its Literature (3, 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: 2316-20-30-40 and consent of instructor.

4007-17-27 String Techniques (1, 1, 1) Problems of string playing; development of string techniques, styles and interpretation, program building. Prereq: Consent of instructor.

4036-37-38 Advanced Piano Literature (2, 2, 2) Piano music for pre-classic period to present. Prereq: Consent of instructor.

4041 Styles in Opera Acting (3) Study and practices of styles in opera acting based on historical and national characteristics. Prereq: 3015 or consent of instructor.

4045 Projects in Opera Theatre (1-3) Prereq: Consent of instructor. May be repeated.

4050 Advanced Instrumental Conducting (3) Development of knowledge and skills in instrumental conducting; study of various periods and composers and relationship of different styles to the conductor's art; musical analysis and practice in conducting. Prereq: Music Education 4430 or equivalent.

4055-56-57 Elementary and Intermediate Piano Pedagogy (2, 2, 2) Piano methods and materials designed for teaching pre-college level students. Prereq: Consent of instructor. 4060 Choral Techniques I (3) Techniques and methods in producing total choral program.

4074-84 Church Music Seminar (3, 3) History and philosophy of church music, liturgies and liturgical music; church music administration. Prereq: Consent of instructor.

4085 Harpsichord Techniques I (1) Techniques, practice, handling, and scoring techniques for the harpsichord. Prereq: Consent of instructor.

4111-21-31-41 Analysis of Music Literature (3, 3, 3, 3) Detailed examination of musical compositions by historical periods with emphasis on works by Bach, Haydn, Mozart, Beethoven, Schubert, Dvorak, Mahler, Berg and Stravinsky.

4113 Pedagogy of Music Theory (3) Techniques, methods and materials involved in college-level theory programs. Prereq: Consent of instructor.

4114 Stage Band Arranging (3) Analysis of scores and for the stage band. Prereq: 3112 and consent of instructor.

4115 Variation (3) Study and application of variation procedures. Prereq: 3123 or equivalent.

4116 Set Structure in Musical Composition (3) Theory of sets and its application to analysis of music. Prereq: Consent of instructor.

4117 Choral Arranging (3) Analysis of scores and writing of arrangements for men's, women's and mixed choruses. Prereq: 3112 or consent of instructor.

4124 Marching Band Arranging (3) Study and application of techniques employed in scoring for marching band. Prereq: 3112 or equivalent.

4134 Concert Band Arranging (3) Study and application of techniques employed in scoring for concert band. Prereq: 3112 or equivalent.

4201 Music in the Romantic Period (3) Survey of music from Beethoven through post-Romantic instrumental and vocal styles.

4230 Contemporary Music: 1945 to Present (3) Study of music since World War II. Includes modern and avant-garde music in Europe and America since World War II.

4241 American Music (3) American music from colonial times to present. Emphasis on twentieth century. Includes both folk and cultivated traditions. Prereq: 1210-20 or equivalent.

4261-71 Introduction to Ethnomusicology (3, 3) Basic attitudes and techniques of ethnomusicology. Survey of music cultures throughout world. 4261—Pacific, Near East and Asia; 4271—Africa, Europe and Americas.


4290 Gregorian Chant (3) Chants of Latin rite. Masses and Offices examined as functional music as well as by type.

4310 History of Art Song (3) Survey of art song from fifteenth century to 1900.

4315 Wind Chamber Music (3) Study of wind chamber music from eighteenth through twentieth century. Emphasis placed on style interpretation, rehearsal techniques, programming and musical significance, both historical and theoretical.

4340-50 Works of Bach (3, 3) Detailed examination of sonatas, chamber, keyboard, and orchestral works; cantatas, motets, passions and oratorios.

4400 Jazz Directing (1) Rehearsal techniques for jazz ensembles: special conducting techniques, repertoire, library systems, programming, and supervised laboratory experience in rehearsing university jazz ensembles. Prereq: Enrollment in Applied Music with jazz emphasis or consent of instructor.

4500 Flute (1-4)

4505 Oboe (1-4)

4510 Bassoon (1-4)

4515 Clarinet (1-4)

4520 Saxophone (1-4)

4525 Horn (1-4)

4530 Trumpet (1-4)

4535 Trombone (1-4)

4540 Baritone (1-4)

4545 Tuba (1-4)

4550 Percussion (1-4)

4560 Violin (1-4)

4565 Viola (1-4)

4570 Cello (1-4)

4575 String Bass (1-4)

4580 Piano (1-4)

4585 Harpsichord (1-4)

4590 Organ (1-4)

4595 Guitar (1-4)

4597 Composition with Electronic Media (1-3) Prereq: Consent of instructor.

4599 Composition (1-3) Prereq: Consent of instructor.

4840 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz and administering of jazz program. Prereq: Enrollment in Applied Music with jazz emphasis or consent of instructor.

4850 Jazz Composition (3) Prereq: Music 4114 and consent of instructor.

4860 Advanced Improvisation (2) Emphasis on further development of individual skills and solving individual problems in jazz improvisation. Prereq: 3052-53.

5000 Thesis (1-15) E

5001 Choral Conducting Project (1-3) Analytical-critical-historical-technical essay on choral music.

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5010 Organ Literature Seminar (3) Topics vary. Prereq: Organ literature.

5012-22-32 Pedagogy of Voice (2, 2, 2) Survey of voice production processes in singing including: voice classification, quality, diction, breathing, breath support, and control. 5022—Examination of teaching materials, preparation of programs for various vocal categories and levels of study. Observation of studio teachings. 5032—Analysis of the vocal
problems of a selected group of students. Supervised teaching. Prereq: 4012-22-32 or consent of instructor.


*5030 Choral Literature Seminar (3) Topics vary.

5033-34-35 Advanced Diction for Singers (2, 2, 2) Practical performance and application of diction theory. Prereq: 2055-65-75 or equivalent.

*5040 Vocal Literature Seminar (3) Topics vary.


5050 Graduate Recital (3)

5051 Opera Performance (3)

5052 Vocal Chamber Music Performance (3)

5054 Lecture-Recital (3)

5055-56 Practicum for Instrumental Conductors (1, 1) Intern experience in choral music and in an instrumental field other than the area of major interest. S/NC only.

5057 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 4060 or equivalent.

5060 Seminar in Choral Performance (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to vocal individual problems. Prereq: 4060 or equivalent.

5061 Choral Conducting (3) Development of choral conducting skills.

*5070 Opera Production (1-3) Prereq: Consent of instructor.

5080 Instrumental Conducting Performances (1) Jury performance; conducting band or orchestra in public.

*5090 Special Topics in Performance (1-3) Prereq: Consent of department head.

*5100 Independent Study in Music Theory (1) Prereq: Consent of department head.

5114 History of Music Theory (3) Work and contributions of theorists from ancient Greece to pre-classic music. Emphasis on 1600 to present. Prereq: Consent of instructor.

5116 Musical Styles (3) Elements of design and their role in definition of musical styles. Exercises in aural and visual identification. Prereq: Consent of instructor.

5121 Analytical Techniques (2) Analytical techniques with emphasis on contemporary approaches. Tonal and nontonal music. Prereq: Consent of instructor.

*5125 Practicum in Computers and Music Research (3) Programming languages, design and implementation of projects in musical analysis, composition and indexing. Prereq: Consent of instructor.

*5150 Seminar in Music Theory (3) Topics vary. Prereq: Consent of instructor.

*5200 Independent Study in Music History and Literature (1-3) Prereq: Consent of department head.

5210 Introduction to Music Research (3) Principles and techniques of research. Required of all candidates with concentrations in musicology or in music theory; recommended for all music students who intend to enroll in a doctoral program.

5220 Music Bibliography (3) Bibliographic methods; illustrative projects in information retrieval and problem solving in music.

*5270 Composer Seminar (3) Topics vary. Prereq: Consent of instructor.

5315 Band Literature (3) Band literature and origins of band emphasizing its important, expanded cultivation during past century in United States and Europe.

5350 Music in the Middle Ages (3) Emphasis on early Christian chant, medieval secular song, early theory, and the development of polyphony and musical notation.

5352 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chansons, madrigal, and other vocal and instrumental forms and genres.

5353 Music in the Baroque Period (3) From 1600 to 1750; rise of opera and oratorio, church and secular cantata, instrumental forms, performance practice.

5355 Music in the Classic Period (3) Preclassic music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artistic activities.

5357 Music in the Romantic Period (3) Survey from Beethoven through post-Romantic instrumental and vocal styles.

5359 Music in the Twentieth Century (3) From 1890 (Debussy) to the present (Stockhausen and others).

5400 Musical Aesthetics (3) Nature of music and musical experience, sense perception and emotions, value in music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.

*5500 Flute (1-4)

*5505 Oboe (1-4)

*5510 Bassoon (1-4)

*5515 Clarinet (1-4)

5520 Saxophone (1-4)

5525 Horn (1-4)

5530 Trumpet (1-4)

5535 Trombone (1-4)

5540 Baritone (1-4)

5545 Tuba (1-4)

*5550 Percussion (1-4)

*5555 Voice (1-4)

5560 Violin (1-4)

5565 Viola (1-4)

5570 Cello (1-4)

5575 String Bass (1-4)

5580 Piano (1-4)

5585 Harpsichord (1-4)

*5590 Organ (1-4)

*5595 Guitar (1-4)

5597 Composition with Electronic Media (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

*5599 Composition (1-3) Prereq: Consent of instructor.

*5600 Small Ensemble (1)

*5602 Brass Choir (1)

*5604 Jazz Ensemble (1)

*5606 Trombone Choir (1)

*5610 Percussion Ensemble (1)

*5611 Marimba Choir (1)

*5612 Baroque Ensemble (1)

*5620 UT Singers (1)

*5630 Chamber Singers (1)

*5632 Collegium (1)

*5634 Saxophone Choir (1)

*5640 Opera Theatre (1)

*5642 Opera Workshop (1)

*5650 Concert Band (1)

*5652 Campus Band (1)

*5654 Varsity Band (1)

*5656 Laboratory Band (1)

*5657 Marching Band (1)

*5670 Symphony Orchestra (1)

*5680 Concert Choir (1)

*5682 University Chorus (1)

*5687 Women's Chorus (1)

*5699 Accompanying (1)

**May be repeated. Maximum 6 hrs.

Philosophy

MAJOR

DEGREES

Philosophy

M.A., Ph.D.

Professors:

J. W. Davi (Head), Ph.D. Emory; R. E. Aguila, Ph.D. Northwestern; L. B. Cebik, Ph.D. Nebraska; R. R. Edmonds, Ph.D. Emory; M. H. Moore (Emeritus), Ph.D. Chicago, D. Van de Vate, Jr., Ph.D. Yale.

Associate Professors:


Assistant Professors:

H. P. Hamlin, Ph.D. Georgia; R. Jones, Ph.D. Chicago; J. E. Neill, Ph.D. Ohio State; D. E. Osi, Ph.D. Texas (Austin); S. Reaven, Ph.D. California (Berkeley).

THE MASTER'S PROGRAM

See general requirements on page 18. Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission.

THE DOCTORAL PROGRAM

Specific requirements for doctoral students in Philosophy include a minimum of three academic years of graduate study involving at least 72 quarter hours credit in course work (normally 24 quarter courses or their equivalent, exclusive of credit for the thesis and dissertation) of which not less than 45 shall be in courses numbered over 5000, and of which at least 9 shall be in a subject other than philosophy. The specific number and distribution of courses will be determined by the student's faculty committee.

Two foreign languages, normally French and German, are required. As an alternative to the two-language requirement, candidates for the Ph.D. may elect to demonstrate a substantially more advanced proficiency in reading knowledge of one language.

Requirements for this option may be obtained in the department office.

Registration in any course in the 5000 or 6000 series (except 5050 and 5010-20-30) may be repeated for credit with the consent of the department. That is, courses having the same number, but with different subject matter, may be taken with each separate subject description.
MEDICAL ETHICS
The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Details concerning the program can be obtained from the department.

RELIGIOUS STUDIES
The department has an M.A. program of graduate study with a concentration in philosophy of religion and other religious studies. Details concerning the program can be obtained either from the Philosophy or Religious Studies Departments.

3111 Ancient Western Philosophy (4) F, W
3121 Medieval Philosophy (4) F, Sp
3131 Seventeenth- and Eighteenth-century Philo-

sophy (4) E
3141 Nineteenth-century Philosophy (4) F, Sp
3151 Contemporary Philosophy (4) Survey of re-

cent movements in philosophy. F
3270 Russian Philosophical and Theological

Thought (4). (Same as Religious Studies 3270 and

Russian 3270.)
3311-12 American Philosophy (4, 4) 3311—Colo-

nial to late nineteenth century. 3312—Late

nineteenth century to present. W, Sp
3320 Philosophy of Law (4) Nature, sources, func-

tion of law. A
3330 Philosophy of History (4) Speculative and criti-

cal aspects of the philosophy of history. A
3410 Philosophical Ideas in Literature (4) Philo-

sophic assumptions and implications in major literary works. W, Su
3420 Philosophy of Literature (4) Study of the na-

ture, functions, value and epistemical principles of literary arts. A
3430 Concepts of Woman (4) Examination of some of the theoretical foundations of feminism and anti-

feminism. F, W, Sp
3440 Social Ethics (4) Ethical theory as related to politics, economics, law, religion and the family. F
3510 Existentialism (4) E
3550 Marxism as Philosophy (4) W
3650 Philosophy and Religion in India (4) (Same as Religious Studies 3650.) F
3860 Buddhist Philosophy and Religion (4)

(Same as Religious Studies 3860.) W
3671 Religion and Philosophy in China (4) (Same as Religious Studies 3671.)
3690 Philosophy of Religion (4) Analysis of basic

issues of religion. (Same as Religious Studies 3690.) F, Sp, Su
3720 Science, Technology, and the Modern

World: A Philosophical Approach (4) Nature and limits of scientific inquiry, and its impact on society. F, Sp
3740-50 Conceptual History of Science (4, 4)

3740—The Scientific Revolution: historical evolution of thought in astronomy, mechanics and philosophy of nature up to Newton. 3750—The development and decline of Newtonian science: historical evolution of thought on the nature of matter and of light, and on that of life. Prereq: 8 hrs of physical science or consent of instructor. F, W
3770 Introduction to Philosophy of Science (4)

Standard topics in philosophy of science: scientific method, nature of laws and theories, problems of induction, explanation, measurement. No background in logic presupposed. F
3810 Introductory Symbolic Logic (4) Techniques

for formal analysis of deductive reasoning (proposi-
tional logic and quantification theory.) Sp
3910 Contemporary Aesthetics (4) Philosophical discussion of contemporary art. F, W, Sp
4000 Special Topics (4) A student- or instructor-

initiated course to be offered at convenience of de-

partment. Subject matter to be determined by mutual

consent of students and instructor with approval of
department. Prerequisites to be determined by de-

partment. May be repeated.
4111-21 Modern Religious Philosophies (4, 4)

(3312) (Same as Religious Studies 4111-21.)
4200 Classical Indian Systems of Philosophy:
The Moksha Tradition (4) (Same as Religious Stu-

dies 4200.)
4310 Intermediate Ethics (4) Topics in metaethics or

ethics. Sp
4370 Theoretical Issues in Medical Ethics (4) Pre-

req: 2310 or 3611 or consent of instructor. (Same as Religious Studies 4370.) Sp
4410 Plato (4) Prereq: 8 hrs philosophy or consent of

instructor.
4420 Aristotle (4) Prereq: 8 hrs philosophy or con-

sent of instructor.
4450 Continental Rationalism (4) Prereq: 8 hrs phi-

losophy or consent of instructor.
4460 British Empiricism (4) Prereq: 8 hrs philoso-

phy or consent of instructor.
4470 Kant (4) Prereq: 8 hrs philosophy or consent of

instructor.
4480 Advanced Topics in Existentialism and Phe-

nomenology (4) Prereq: 8 hrs philosophy or consent

of instructor.
4510 Intermediate Symbolic Logic (4) Axiomatic
development of propositional calculus and first-order

functional calculus. Prereq: 3810 or equivalent.
4511 Advanced Topics in Logic (4) Prereq: Con-

sent of instructor. May be repeated.
4610 Philosophical Analysis (4) Prereq: 8 hrs phi-

losophy or consent of instructor.
4620 Philosophy of Mind (4) Problems of mind and

body in relation to consciousness and personal

identity. Prereq: 8 hrs philosophy or consent of in-

structor.
4630 Philosophy of Language (4) Prereq: 8 hrs phi-

losophy or consent of instructor.
4710 Philosophy of Natural Science (4) Consid-

eration of standard topics pertinent to natural sci-

ence including reduction of theories and teleological

explanation. Familiarity with symbolic logic is recom-

mended. Prereq: 3770 or 2 yrs natural science.
4720 Philosophy of Social Science (4) Examina-

tion of methods of inquiry and modes of explanation

in social sciences. Prereq: 3770 or 2 yrs social sci-

ence.
4810 Metaphysics (4) Prereq: 8 hrs philosophy or consent

of instructor.
5000 Thesis (1-15) E
5050 Symbolic Logic (4)
5080 Philosophy of Logic (4) Nature of logic: epistemo-

logical, metaphysical and axiological assump-

tions and implications in various theories of logic.
Prereq: 4510 or equivalent.
5101 Foreign Study (1-12) See page 97. E
5102 Off-campus Study (1-12) See page 97. E
5103 Independent Study (1-12) See page 97. E
5110-20-30-40-50-60 Studies in the History of

European Philosophy (4, 4, 4, 4, 4, 4) Intensive

critical work on major philosopher or school. 5110—

Greek, 5120—Heimetic or Medieval, 5130—Mod-
ern, before Kant, 5150—Kant, 5150—Nineteenth

Century, 5160—Twentieth Century.
5250 Studies in the History of American Philosoph-

y (4) Intensive, critical work on major philosopher

or school.
5310-20-30 Studies in Value and Normative

Theories (4, 4, 4) 5310—Axiology. 5320—Ethics

and methodology. 5330—Aesthetics.
5355 Orientation to Medical Ethics (2) Survey of

ethical theories in application to issues in medical

erthics. Consent of Medical Ethics Committee re-

quired. (Same as Religious Studies 5355.) F
5365 Applied Ethical Theory (4) Single author,

tradition, or topic in ethical theory with special atten-

tion to application to issues in health, business, tech-

nology, ecology, and other practical fields. (Same as Religious Studies 5365.) W
5370 Topics in Medical Ethics (4) Prereq: 4370-71

or consent of Medical Ethics Committee.
5375 Clinical Medical Ethics (1) Medical terminolo-

gy, history of medical ethics, case study discussions,

clinical observation. Open only to students concen-

trating in medical ethics. Prereq: 5355 and consent

of Medical Ethics Committee. May be repeated. Max-

imum 8 hrs. S/NC only.
5410 Philosophy of History (4) Theories of history and

historical processes.
5430 Philosophy and Literature (4) Mutual influ-

ence of philosophy and literature, possibility of a phi-

losophy of literature, philosophy of criticism.
5450 The Problem of the Self (4) Current studies in

sociology, social psychology, and philosophy to amend and elucidate traditional philosophical treat-

ments of problem of self.
5460 Philosophy of Mind (4) Relation of mental to physical and of role of words in discourse for mental activities such as thinking and feeling.
5510-20 Studies in Epistemology (4, 4) 5510—

Modern rationalism: Descartes, Spinoza, Leibniz,

5520—Modern empiricism: Locke, Berkeley, Hume.
5550-60 Philosophy of Science (4, 4) Nature of subject matter and method of sciences. 5550—Na-

tural sciences, 5560—Social Sciences.
5610 Recent Developments in Philosophy of Reli-

gion (4)
5710 Studies in Metaphysics (4) Metaphysics of philosher or systematic philosophic tradition.
5810 Social and Political Philosophy (4)
5940 Lakeshore Clinical Residence (6) Seven-

week clinical practicum at Lakeshore Mental Health Institute concentrating on ethical issues in mental

health care. Open only to students concentrating in medical ethics. Prereq: Consent of Medical Ethics

Committee. S/NC only.
5950 Clinical Practicum in Medical Ethics (4-12)

Prereq: Consent of Medical Ethics Committee. Open only to students concentrating in medical ethics. S/

NC only. E
6000 Doctoral Research and Dissertation (3-15) E
6110-20-30 Seminars in the History of European

Philosophy (4, 4, 4)
6150 Seminars in the History of American Philo-

osophy (4)
6250 Seminar in the Philosophy of Religion (4)
6310 Seminar in Axiology (4)
6370 Advanced Topics in Medical Ethics (4) Pre-

req: 5370 or consent of Medical Ethics Committee.
6510 Seminar in Epistemology (4)
6550 Seminar in Philosophy of Science (4)
6950 Advanced Residence in Medical Ethics (4-12)

Prereq: Consent of Medical Ethics Committee.
All first-year graduate students are required to take a qualifying examination in undergraduate physics during the fall quarter registration period.

THE MASTER'S PROGRAM

The Physics Department has two Master's degree programs—thesis and non-thesis.

The thesis program is primarily designed for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 56 quarter hours in such courses as Physics 4510-20-30, 4610-20-30, 5110-20-30, 5210-20-30, 5310-20-30, 5610-20-30 and appropriate courses in related fields. Each candidate must present an acceptable thesis, equivalent to 9 hours of credit, and pass an oral examination on course material and thesis.

The non-thesis program is primarily designed 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 an M.S. in Physics by this method must apply to the department's graduate committee for permission to enroll under this program. The requirements for the M.S. under this method are the satisfactory completion of 45 hours of course work composed of 21 hours from core courses numbered above 5000 (e.g., 5110-20-30, 5210-20-30, 5310-20-30); 9 hours in a minor field (e.g., mathematics); and 9 hours from other courses in physics numbered above 4000 (preferably of advanced level). In addition, the candidate must pass a comprehensive examination administered by the committee. The Physics Department is also participating in the program which leads to the Master of Arts in College Teaching degree. In addition to the requirements for either of the Master's programs described above, the MACT degree in Physics requires 15 more hours of credit, including 9 of these hours in courses numbered above 5000.

The thesis program is primarily designed for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 56 quarter hours in such courses as Physics 4510-20-30, 4610-20-30, 5110-20-30, 5210-20-30, 5310-20-30, 5610-20-30 and appropriate courses in related fields. Each candidate must present an acceptable thesis, equivalent to 9 hours of credit, and pass an oral examination on course material and thesis.

The non-thesis program is primarily designed 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 an M.S. in Physics by this method must apply to the department's graduate committee for permission to enroll under this program. The requirements for the M.S. under this method are the satisfactory completion of 45 hours of course work composed of 21 hours from core courses numbered above 5000 (e.g., 5110-20-30, 5210-20-30, 5310-20-30); 9 hours in a minor field (e.g., mathematics); and 9 hours from other courses in physics numbered above 4000 (preferably of advanced level). In addition, the candidate must pass a comprehensive examination administered by the committee. The Physics Department is also participating in the program which leads to the Master of Arts in College Teaching degree. In addition to the requirements for either of the Master's programs described above, the MACT degree in Physics requires 15 more hours of credit, including 9 of these hours in courses numbered above 5000.
1416 Physical Acoustics (4) Considerations fundamental to detailed investigation of any branch of acoustics, with particular emphasis on the acoustics of the infrasonic, the audible, the ultrasonic, and the hypersonic ranges of frequencies. Prerequisite: 3210-20, 3230. 3 hrs and 3 hrs lab. F, S, Sp.

5210-20-30 Advanced Modern Physics (3, 3, 3) Basic principles of wave mechanics; one-electron atom; atomic and molecular spectroscopy; molecular binding; relativity; properties of nuclei; spin, magnetic moments, and beta-particle phenomena; nuclear models and forces; high-energy physics. Prerequisite: 3210-20, 3710-20-30, 4210-20, differential equations. Must be taken in sequence. F, W, Sp.


4510-20-30 Atomic Physics Laboratory (3, 3, 3) Experiments in fundamental properties of matter, photoelectricity, conduction of electricity through gases, photoelectric, X-ray, Prerequisite or corequisite: 3710-20-30, 3 labs. E.


5720 Physics of Polyatomic Molecules (3) Introduction to electronic structure of molecules and physical processes of luminescence of these molecules, theoretical and experimental aspects of inter-molecular and intramolecular excitation energy transfer and charge transfer; application of excitation energy transfer and charge transfer in such fields as organic molecular reactivity and organic semiconductors. Prerequisite: 5210-20 or consent of instructor. F, W, Sp.

5850 Principles of Nondestructive Testing (3) Detection and characterization of discontinuities in materials by nondestructive physical measurements. Ultrasonic, electromagnetic, holographic and penetrating radiation techniques are discussed. Prerequisite: 2310 by permission of instructor. (Same as Engineering Science 4580). W.

5860 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, pointed toward the computer, the use of the computer, analysis of errors. Prerequisite: 5610-20-30, or consent of instructor. (Same as Mathematics 5640). F.

6110 Interaction of Radiation with Gases (3) Interaction of electromagnetic radiation with atoms and molecules; oscillator strength, interaction of charged particles with atoms and molecules; ionization; transduction and light emission. Electron interaction, transport and capture; electron-swell and electron beam experiments. Prerequisite or corequisite: 6110-20-30, F.

6200 Interaction of Electrons with Solids (3) Collisions with free electrons; stopping power; electron slowing down spectra; energy straggling; nuclear scattering; electron diffusion; plasma effects in irradiated solids; techniques in electron spectroscopy; applications to dosimetry. Prerequisite or corequisite: 6110-20-30, F.

6300 Interaction of Radiation with Matter (3) Topics in atomic collision theory. Photoatom interactions; electron-atom and electron-molecule collisions, dielectric theory, stopping power, collective excitations in electronic systems, Cherenkov radiation, electron transport in gases and solids. Prerequisite or corequisite: 6110-20-30, W.

3622 Contemporary South and Southeast Asian States (4) Analysis of selected states, with emphasis on problems of development.

3625-26 Latin American Government and Politics (4, 4) W, F

3626 Government and Politics of the Soviet Union (4, 4) W, F

3635-36 Politics in Western Democracies (4, 4) Political culture, patterns, and institutions of Western democratic systems. F, Sp; A, W

3641 Government and Politics of Middle East and North Africa (4)

3710 State Politics (4) Focus on formal and informal setting of state government; governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy. F

3720 State Government and Policy Making (4) Nature and functions of the institutions of state government: governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy. W

3750 The Urban Policy (4) Analysis of political institutions and processes in metropolitan areas. W

3760 Urban Policy Process (4) Analysis of urban problems and policies in metropolitan areas. Sp

3796 Contemporary Problems of Soviet Foreign Policy (4) Sp

3801 Studies in Ancient Political Thought (4) Classical Greek and Roman political thought. F

3802 Studies in Medieval Political Thought (4) From Augustine to Luther; emphasis on problems and theories of religion and politics. W or Sp

3803 Studies in Early Modern Political Thought (4) Machiavelli through the Enlightenment. W

3804 Studies in Nineteenth- and Twentieth-century Political Thought (4) Political theories of industrial and technological societies; nineteenth and twentieth century. Sp

3880 American Political Thought (4) Examination of role of selected political ideas, doctrines, and movements in America, emphasizing their development and relationships to diverse political interests. F

4060 Revolution (4) Characteristics, theories, and consequences of revolution, with particular focus on left-wing revolutions and movements. Sp

4410 Law and the Administrative Process (4) Principles, procedures, of controls over administrators. Sp

4535-36 Political Attitudes, Opinions and Communication (4, 4) Nature, development, formation and distribution of politically relevant attitudes and opinions; role of leadership, persuasion, and communication in opinion-policy process. F, W


4545-46 The Judicial Process (4, 4) The study of courts as components of political systems, and public policy formulation through judicial decision making. Recommended prereq: 2510-20. Sp; W

4550 Congress (4) Nature, functions, and processes of U.S. Congress. Sp

4575 Special Topics in United States Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs. W

4610 Budgetary Process (4) Fiscal planning, budget and expenditure processes in government, their policy and administrative implications. W or Sp

4620 Public Personnel Administration (4) Development of the merit system in government, career systems, public personnel management functions, organization for personnel management. F or W

3615-16 Dynamics of Black African Politics (4, 4) F; W

3621 Contemporary China and Japan (4)

Cooperating public agency (9 quarter hours), and 15 quarter hours in an elective specialized track developed by the student with the approval of the coordinator of the M.P.A. program. The specialized track will often contain a mix of courses from political science and one or more outside fields; examples include general government, public health administration, fiscal administration, social services administration, administration of criminal justice, urban administration, environmental and natural resources administration.

Inquiries concerning all programs should be directed to the Department of Political Science, Knoxville, Tennessee 37916.

THE DOCTORAL PROGRAM
Specific requirements for the degree of Doctor of Philosophy in Political Science include:
1. A minimum of 117 quarter hours following the Bachelor's degree, is required. At least 93 hours shall be in political science. At least 72 hours in political science shall be graduate level hours (i.e. earned in 5000- or 6000-level courses). At least 45 of these graduate level hours shall be at the 6000 level. This figure includes 36 hours of credit for the dissertation.
2. Each Ph.D. candidate must pass an examination into a foreign language. Students specializing in some areas may be required to demonstrate knowledge of a second language or appropriate research tools or both.
3. Admission to candidacy shall be based on a written and oral comprehensive examination which must be passed not later than three quarters before the date on which the degree is granted.
4. The candidate must pass a final oral examination on the doctoral dissertation.
5. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.

3545 United States Constitutional Law: Sources of Power and Restraint (4) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political rights. Recommended prereq: 2510-20. F, W


3555 Minority Group Politics in the United States (4) Content varies from quarter to quarter. May be repeated with consent of department. Maximum 8 hrs. W

3565 Introduction to Public Administrative Organization and Management (4) Organization and decision-making theory, line and staff services, politics of organization, leadership, personnel and fiscal management, administrative responsibility. Recommended prereq: 2510-20. F, W, Sp


3605 Political Change in Developing Areas (4) Characteristics and problems of political changes with primary focus on developing areas. F, Sp

3615-16 Dynamics of Black African Politics (4, 4) F; W

*Distinguished Professor.*
4656-56 Politics Making in Democracies (4, 4) Comparative approach to theory and process of making public policies. F; Sp; W

4675 Special Topics in Comparative Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.

4701-02 International Organization (4, 4) 4701—The League of Nations and the United Nations. 4702—Functional and regional organizations. W or Sp

4711 International Law (4)

4727 Politics of Inter-American Relations (4) Analysis of selected theoretical and policy issues concerning international relations in the Americas with emphasis upon imperialism, intervention, and the Cuban Revolution, nationalism, foreign assistance, trade and economic integration. Sp, A

4740 Political Parties and Elections (4) Analysis of party systems and electoral processes. F, W

4750 Political Campaigns (4) All aspects of campaign process. F, W

4815 Contemporary Soviet Marxism-Leninism (4) Soviet applications of Marxist-Leninist theory.

4875 Special Topics in Political Thought (4) May be repeated with consent of department. Maximum 8 hrs.

4940 Politics and the Environment (4) Examination of formulation and implementation of public policies relating to physical environment with emphasis upon water and air pollution control. Sp

4975 Proseminar in Political Science (4) Selected research for seniors; primarily for majors. May be repeated with consent of department. Maximum 8 hrs.

5000 Thesis (1-15) E

5062 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5101 Foreign Study (1-12) See page 97. E

5102 Off-campus Study (1-12) See page 97. E

5103 Independent Study (1-12) See page 97 E

5110-20 Seminar in Political Theory (3, 3) Selected political thinkers, schools, historical periods. F; W, Sp

5140 Politics, Administration and Community in Nonmetropolitan Areas (3) Analysis of problems and processes associated with community development. Sp

5150 Internship in Political Science (3-9) Open to students participating in approved internship programs. May be repeated with consent of instructor. Maximum 9 hrs. S/NC only. E

5210-20 Seminar in World Politics (3, 3, 3) Research in world problems and organization. F; W; Sp

5211 Directed Readings in Political Science (3) May be repeated with consent of instructor and student's advisor. Maximum 8 hrs. May be taken for letter grade or S/NC. E

5250 Seminar in African Politics (3) Selected topics in African politics.

5270 Seminar in the Politics of Development (3) Selected topics dealing with political problems of less developed countries. F

5310-20 Seminar in Comparative Government (3, 3) Selected topics in modern government. Sp

5340-50 Seminar in Latin American Government (3, 3) W

5410-20 Seminar in Public Law (3, 3) Special problems in constitutional and administrative law. F

5440-50 Theory and Analysis of U.S. Foreign Policy Processes (4) Theoretical approaches to decision making in foreign policy area and analysis of policy-making process. W

5510-20 Seminar in International Organization (3, 3) 5510—Introduction to regional international organizations; political integration at international level. 5520—Functional international organizations.

5540 Seminar in Comparative Public Administration (3) Approaches to and methods used in comparative analysis.

5550 Seminar in Administration in Developing Countries (3)

5600 Public Administration (3) Public administration theory and functions, approaches to public management, contemporary problems in public administration. F

5605 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and reporting of data. W

5610-20 Seminar in Organization Theory (3, 3) Appraisal of major theories of organization and their applicability to public sector. F

5611-21-31 Seminar in State-Local Administration (3, 3, 3)

5630 Seminar in Technology and Public Policy (3) Technological change and policy process, government interaction with scientific community, political characteristics of scientific enterprise.

5635-45 Operations Research for Public Administrators (3, 3) Operations research methodology; applications and limitations in public sector; linear programming, transportation and assignment problems, network analysis, PERT, dynamic programming and other methods.

5640-50-60 Seminar in Metropolitan Areas (3, 3, 3)

5841 Seminar in Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor.

5670-80 Seminar in Policy Analysis (3, 3) Role of administrators in policy analysis and decision making with special attention to historical and current issues. Sp

5710 Seminar in the Politics of Administration (3) Examination of public administration in context of American political system with emphasis upon policy making and political roles of public administrators and agencies. W

5730 Seminar in Public Budgeting and Fiscal Management (3) Budgetary process, fiscal management, and finance in American government. Sp

5740 Seminar in Organizational Analysis (3) Organization theory applications in public management; field analysis of public organizations.

5750-55 Seminar in Public Management (3, 3) Selected problems. F; W

5785-75 Law and the Administrative Process (3, 3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. W

5770 Practicum in Public Administration (3) Sp

5785-95 Seminar in Staff Functions (3, 3) Functions of administrative staff personnel serving political, executive, public bureaucratic, legislative bodies, and advisory and community groups in public sector. Selected topics include budgeting, personnel, evaluation, and other staff functions.

5790 Seminar in Public Personnel Management (3) Functions and organization of personnel administration in public service. Sp

5810 The American Political Process (4) Principal patterns of political activity linking citizens and political institutions. Sp

5820 The American Political Process (4) Selected problems in American politics. Sp

5831-32 The Systematic Study of Politics (3, 3) Scope, methods and procedures of analysis in political science. F; W

5840 Ethics, Values, and Morality in Political Science (3) Political processes; social, economic, political, philosophical and ethical implications. F

5850 Seminar in Comparative State Politics (3) Intensive readings in comparative state politics focusing on environment of state politics, institutions and policy making.

5910-20 Quantitative Political Analysis (3, 3) Methods and techniques in quantitative political analysis. F; W

5930 Topics in Quantitative Political Analysis (3) Selected topics in quantitative methods.

6000 Doctoral Research and Dissertation (3-15) E

6210 Advanced Studies in International Politics (3)

6310 Advanced Studies in Political Theory (4) Research into selected topics. F

6410 Advanced Studies in International Organization (3) Research in selected topics.

6440 Advanced Studies in Comparative Politics (3) Research into selected topics. Sp

6510-20 Advanced Studies in American Constitutional Law (3, 3) Systematic investigation of federal relations, civil liberties, courts in political settings, judicial institutions, personnel, and public policy content.

6510-20 Advanced Studies in Public Administration (3, 3) Research into selected topics. W; Sp

6710 Directed Research in Political Science (3) May be repeated with consent of instructor and student's advisor. Maximum 9 hrs. May be taken for letter grade or S/NC.

6810-20 Advanced Studies in the Political Process (3, 3) Open to advanced graduate students upon approval of instructor. W

Psychology

MAJOR

DEGREES

Psychology

M.A., Ph.D.

Professors: W. H. Calhoun (Head), Ph.D. California (Berkeley), J. A. Wiberley, Ph.D. Syracuse.


*Part-time

*Alumni Distinguished Professor.
4620 Seminar in Group Processes (3, 3) Didactic and laboratory experience for those qualified for further training as group facilitators. Prereq: 4620 and consent of instructor. W, Sp

4640 Psychological Tests and Measures (4) Theory and construction of individual and group measures; survey of various methods of assessment of intelligence, personality, special abilities, and educational achievement. Prereq: 3150. F, Su

4650 Symbolic Processes (4) Logic of signs and symbols; directed and associative thinking; memory, problem solving, and concept formation; nature, use, and development of language. Prereq: 3210 or consent of instructor. F

4660 The Psychology of Language (4) Theories and descriptions of phonology, syntax, and semantics as applied to psychology and related disciplines. Recommended: 4650 or linguistics background.

4670 Cognitive Development (4) Theory and research on development of language and thinking in children and adolescents. Prereq: 3210 or 3550.

4710 Physiological Psychology (4) Nervous system and physiological correlates of behavior. Prereq: 1 yr of biology or zoology and 2520. W

4719 Physiological Psychology Laboratory (4) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 4710. W

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Zoology 4720.) F

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Zoology 4729.) F

4750 Evolution and Ontogeny of Social Behavior (4) Genetic, evolutionary, ecological, and developmental processes as they apply to social organization and dynamics of vertebrates. Prereq: Consent of instructor.

4770 Psychology and the Law (4) Psychological aspects of the legal system. Prereq: Junior standing.

4830 History and Systems of Psychology (4) Prereq: 9 hrs of upper division psychology.

4850 Learning Theories (4) Historical and theoretical development of learning models. Prereq: 3210.

4860 Programmed Learning (3) (Same as Curriculum and Instruction 4860.) F

4870 Contemporary Research in Behavior of Women (4) Study of interaction of cultural and biological factors in determining the behavior of women, with emphasis on physiological mechanisms involved. Sp

4880 Afro-American Psychology (4) Review and analysis of psychological literature on Afro-Americans. Prereq: Consent of instructor. (Same as Black Studies 4880.)

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) E

5017 Colloquium in Ethology (1) May be repeated. Maximum 9 hrs. (Same as Zoology 5017.) S/NC only.

5019 Research Practicum (1-3) Required of all first-year students in experimental, physiological, and comparative psychology. May be repeated. Maximum 9 hrs. S/NC only.

5050 Methods of Research in Applied Psychology (3) Techniques and principles for designing and conducting psychological research in natural settings.

5070 Seminar in College Teaching (2) Concepts, methods, and materials in introduction of psychology at college level. Emphasis on research. Required of all Ph.D. candidates. S/NC only.

5079 Practicum in College Teaching (2) Supervised participation in college teaching. S/NC only. Sp

5100 Developmental Psychology (3) Prereq: 3550 or Educational Psychology 2430. (Same as Educational Psychology 5100.) F

5105 Developmental Assessment (3) Techniques for assessing development in infants and children. Does not include practicum. Prereq: 5100 or equivalent and consent of instructor.

5110 Clinical Aspects of Human Sexuality (3) Nature of sexuality; societal perspectives, personal identity, application, intimacy and isolation including psychosocial and psychosexual identity and models for decisions. Intended for graduate students in clinical psychology, social work, and community and mental health professions. Prereq: Consent of instructor.
5550 Advanced Social Psychology (3) Interaction between individual and group, theories of group behavior. Prereq: 3120. May be used for credit in sociology.

5560 Seminar in Social Psychology (3) Prereq: 5550. May be used for credit in sociology. May be repeated. Maximum 8 hrs.

5580 Theories of Personality (3)

5581-82-83 Clinical Psychology I: Human Development and Personality (2, 2, 2) First quarter core of doctoral program in clinical psychology. Students take 3-2-hr courses concurrently, each covering content area from one to three major contemporary points of view. F

5589 Psychological Techniques Laboratory (2) Basic techniques of psychological appraisal. Restricted to doctoral students in clinical psychology.

5591-92-93 Clinical Psychology I: Patterns of Adaptation (2, 2, 2) Second quarter core of doctoral program in clinical psychology. Students take 3 2-hr courses concurrently, each covering content area from one of three major contemporary points of view.

5601-02-03 Clinical Psychology I: Behavioral Deviance and Psychopathology (2, 2, 2) Third quarter core of the doctoral program in clinical psychology. Clinical students take 3 2-hr courses concurrently, each covering content area from one of three major contemporary points of view. Sp

5620-20 Psychology of Learning (3, 3) Prereq: 3210 or Educational Psychology 3730. F; W

5650 Ethics in Professional Psychology (2) Review of ethical concerns in professional psychology. Multiple instructors. Meets 3 hrs per week. Sp

5670 Forensic Psychology (2) Psychologist’s role in relation to law, including questions concerning licensing requirements, legal restrictions, and testimony as expert witness. Offered in alternate years. Prereq: M.A. in psychology or equivalent.

5680 Neural Basis of Behavior (3) Neuroanatomy; basis and symptomatology of neurological syndromes encountered in clinical psychology. Prereq: M.A. in psychology or equivalent.

5690 Psychopharmacology (3) Review and evaluation of pharmacology as it relates to psychology. Prereq: Consent of instructor. Offered in alternate years. Sp, A

5702 Community Psychology (3) Psychological aspects of research, evaluation, intervention, and planning in communities. Community ecology; systems analysis; primary and secondary prevention, planning of social systems, and relevance of federal policies. Prereq: Consent of instructor.

5713 Learning Modules for Techniques in Professional Psychology: Each develops skill in assessment, technology, child ethology, or pathology. Prereq: Consent of instructor. May be repeated. S/NC only.

5750 Ethological Psychology (3) Evolutionary and physiological basis of comparative psychology and implications for human behavior. Prereq: Introduction to psychology and magnitude of study.

5760 General Vertebrate Neuroanatomy (3) Lecture and laboratory dealing with structure and function of central and peripheral nervous system. Prereq: 4710, 4719, or consent of instructor. Prereq: Introduction to psychology and magnitude of study.

5789 Advanced Techniques in Physiological Psychology (3) Animal and human laboratory procedures related to research in physiological psychology. Prereq: 4760, 4790, and consent of instructor. May be repeated with consent of instructor.

5790 Seminar in Psycholinguistic Concepts in Speech Pathology (3) Same as Speech Pathology 5790.

5840 Student Appraisal (3) Same as Educational Psychology 5840.

5850-60-70 Psychological Appraisal (3, 3, 3) Objective and projective tests, clinical interviewing, case study, psychodynamics, and functional and disorders. Prereq: 5819. Prereq or coreq: 5850-60-70.

5859-60-79 Practicum in Psychological Appraisals (2, 2, 2) Ordinarily to be taken concurrently with 5850-60-70. Prereq: Consent of instructor.

5890 Counseling Theories and Techniques (3) (Same as Educational Psychology 5980)

5950-60 Theory and Practice of Consultation (3) Issues in consultation, models of consultation, and evaluation of consultation techniques. Must be taken in sequence. Coreq: 5959-60 and consent of instructor. (Same as Educational Psychology 5950-60.) W; Sp

5959-69 Practicum in Psychological Appraisal (2, 2) Coreq: 5950-60-70. Prereq: Consent of instructor. Must be taken in sequence. (Same as Educational Psychology 5959-69.) S/NC only. W; Sp

6000 Doctoral Research and Dissertation (3-15) E

6050 Seminar on Methods of Social Research (3) (Same as Sociology 6050.)

6069 Internship in Community Psychology (1-6) Supervised employment at departmentally approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.

6099 Internship in School Psychology (1-6) Supervised employment at departmentally approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.

6100 Seminar in Community Psychology (3) Evaluation, research, intervention, and systems for delivery of services in communities. Prereq: 5702.

6160 Seminar in Program Evaluation (3) Techniques for designing and conducting research to evaluate effectiveness of programs. Prereq: Statistics 5050-60-70 or equivalent and consent of instructor.

6159 Practicum in Program Evaluation (3) Designing, conducting, and analyzing results of program evaluation in school or community setting. Prereq: 6160 and consent of instructor.

6180-20-30 History, Systems, and Theories in Psychology (3, 3, 3) Prereq: M.A. in psychology or equivalent. Must be taken in sequence.

6250-60-70 Seminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 6250-60-70.)

6280-90 Factor Analysis (3, 3) Factor analysis; component analysis; introduction to latent structure analysis. Prereq: 4640 and 5500.

6310 Seminar in Motivation and Emotion (3)

6319 Field Work in School Psychology: Level II (2) Supervised on-the-job training in school psychology; limited to students fully admitted to doctoral program in School Psychology assigned to program approved field settings. Prereq: 5960-60. May be repeated. Maximum 6 hrs. (Same as Educational Psychology 6319.) S/NC only. F, W, Sp

6320 Seminar in Research Methods (3)

6330 Seminar in Learning (3)

6340 Seminar in Developmental Psychology (3)

6350 Seminar in Thinking (3)

6360 Seminar in Sensation and Perception (3)

6370 Seminar in Theoretical Psychology (3)

6380 Seminar in Industrial and Organizational Psychology (3) (Same as Management 6380.)

6385 Hypnosis and Imagination (3) Demonstration and practice of hypnotic induction methods, survey of clinical applications of hypnosis and imagery. Prereq: Consent of instructor.

6390 Seminar in Psychotherapy (2) Treatment of current case, focusing upon psychodynamics, psychopathology, and therapeutic techniques employed. Prereq: Consent of instructor.

6395 Seminar in Assessment (3) Seminar for advanced graduate students in clinical psychology, to deal with current research on methods of evaluating the status of individuals seeking clinical aid.

6400 Seminar on Changing Concepts in Clinical Psychology (3) New field in relation to their impact on experimentation and systems of thought. Prereq: M.A. in psychology or equivalent.

6405 Seminar in Psychopathology (3) Prereq: Consent of instructor.

6410-20-30 Psychotherapy (3, 3, 3) Theories and principles of psychotherapy. Prereq: 5960-90. Prereq or coreq: 5850-60. W; Sp

6411-12-13-14 Psychotherapy: Elective Concentration Learning Laboratory (2, 2, 2, 2) Typically four psychotherapy concentration areas offered each quarter. Clinical students in core psychotherapy sequence must elect at least one of these in each quarter of sequence. May be limited. Limited to clinical psychology students enrolled in core psychotherapy sequence or consent of instructor.


6450-60 Advanced Psychometrics (3, 3) Construction and standardization of psychological tests, questionnaires, and rating scales, theory of errors or measurements; item analysis, scaling, equating, and norms development. Prereq: 4650, 5440, and 5560. May be repeated. Maximum 9 hrs.

6491-2-3-4 Field Placement in Clinical Psychology Levels 1, 2, 3, 4, (1-8, 1-8, 1-8, 1-8) Supervised clinical experience. Required of and limited to students fully admitted to Ph.D. program in Clinical Psychology. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs per course. S/NC only. W; Sp; F

6500 Seminar in Psychometrics (3) Seminar for advanced graduate students in psychometrics or quantitative psychology, to deal with advanced theories, methodologies, and their applications. Prereq: 4640, 5500 or equivalent, and consent of instructor. May be repeated. Maximum 9 hrs.

6550 Seminar in Advanced Social Psychology (3)

6575 Seminar in Mental Health Administration (3) Theory and problems in organization and management of mental health administration.

6702 Social Ecology (3) Seminar on current topics: ecological psychology, quality-of-life, social impact assessment, and environmental classification. Prereq: Consent of instructor.

6710 Seminar in Physiological Psychology (3)

6720 Seminar in Comparative and Ethological Psychology (3)

6730 Methods of Ethological and Naturalistic Research (3) Current laboratory and field techniques. Prereq: 4729, 5750, 6720, or consent of instructor.

6780 Advanced Psycholinguistics (3) Language from psychological and associated points of view, methodological and theoretical problems.

6900 Field Work in Industrial and Organizational Psychology (1-15) (Same as Management 6900.)
Radiation Biology (Interdepartmental)

5000 Thesis (1-15) E
5300 Graduate Research Participation (3-9) May be repeated. Maximum 12 hrs. E
5610-20 Foundations of Radiation Biology (4, 4) (Same as Zoology 5610-20.)
5780 Radiation Physiology (4) (Same as Zoology 5780.)
6000 Doctoral Research and Dissertation (3-15) E
6910 Seminar in Radiation Biology (2) (Same as Zoology 6910.)

Religious Studies


Assistant Professors: R. R. Earl, Ph.D. Vanderbilt; J. L. Fitzgerald, Ph.D. Chicago; J. Kim, Ph.D. Chicago.

An M.A. in Philosophy with a concentration in religious studies is available for graduate work in this related field. Details of this program are available in the office of each department. Graduate courses in religious studies further provide opportunity for students in a variety of disciplines to pursue work in religious studies as a graduate concentration.

3060-70-80 History of Western Religious Thought and Institutions (3, 3, 3) 3060 — First Century to Fifth Century 3070—Sixth Century to Fifteenth Century 3080—Sixteenth Century to 1900. (Same as History 3060-70-80.)
3210 Early Greek Mythology (3) (Same as Classics 3210.)
3220 Early Greek Mythology in the Classical Period (3) (Same as Classics 3220.) W
3230 Roman Mythology (3) (Same as Classics 3230.) Sp
3270 Russian Philosophical and Theological Thought (4) (Same as Philosophy 3270 and Russian 3270.)
3411-12 The Reformation (3, 3) (Same as History 3411-12.)
3440 Religion of Primitive Peoples (3) (Same as Anthropology 3440.)
3650 Philosophy and Religion in India (4) (Same as Philosophy 3650.) F
3660 Buddhist Philosophy and Religion (4) (Same as Philosophy 3660.) W
3671 Religion and Philosophy in China (4) (Same as Philosophy 3671.)
3690 Philosophy of Religion (4) (Same as Philosophy 3690.)
4111-21 Modern Religious Philosophies (4, 4) Examination of the religious implications of major think- ers and movements. 4111—Nicolas of Cusa to Hume. 4121—Kant and the nineteenth century. Pre- req: 9 hrs of philosophy other than logic. (Same as Philosophy 4111-12.)
4200 Classical Indian Systems of Philosophy: The Moksha Tradition (4) Basic writings and philo- sophic problems of the traditions of Sankhya, Yoga, and Vedanta. Prereq: 3650 or 3660. (Same as Phil- ology 4200.)
4210 Topics in Ancient Israelite and Ancient Near Eastern Religion (4) Prereq: 3110-20 or consent of instructor. May be repeated. Maximum 8 hrs.
4310 Jesus and Paul Compared (4) Jesus' teaching and activity in the context of first-century Palestine Judaism; analysis of what the Apostle Paul made of the tradition of and about Jesus. Recommended prereq: 2610 or 2611.
4370 Theoretical Issues in Medical Ethics (4) (Same as Philosophy 4370.)
4410 American Religious Thought (4) Selected fig- ures, movements and problems in American religi- ous thought from colonial period to present.
4450 Topics in American Religion (4) Prereq: One of the following: 3510, 3520, 4410, or consent of instructor. May be repeated. Maximum 6 hrs.
4540 Social and Religious Change (4) (Same as Sociology 4540.)
4610 Topics in Western Religious Thought and Institutions (4) Selected figures, issues, and institu- tions. Seniors and graduate students only, except by consent of department. Prereq: 3060-70-80. May be repeated. Maximum 12 hrs.
4640 Topics in Early Christianity and Hellenistic Religion (4) Selected figures, issues, and institu- tions. Seniors and graduate students only, except by consent of department. Prereq: Consent of in- structor. May be repeated. Maximum 12 hrs.
4670 Topics in Eastern Religions (4) Selected fig- ures, issues, and institutions. Seniors and graduate students only, except by consent of department. Pre- req: 3650-60-71-72. May be repeated. Maximum 12 hrs.
4840 Sociology of Religion (4) (Same as Sociology 4840.)
4950 Theory of Religion (4) Elements for construc- tion of a theory of religion drawing on resources from fields of psychosociology, social psychology, sociology of religion, cultural anthropology, theology and com- parative religion.
4960 Tradition, Change and Modernity in Asia (4) Comparative study of processes of religious and so- cial change seen in historical context in Asian societies. Comparative focus, issue will vary each year (e.g., China and Japan, India and South Asia). May be repeated. Maximum 6 hrs. (Same as Sociol- ogy 4960.)
5101 Foreign Study (1-12) See page 97.
5102 Off-campus Study (1-12) See page 97.
5103 Independent Study (1-12) See page 97.
5310-20 Topics in Religion and Society (4, 4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: 3650-60-71-72. May be repeated. Maximum 12 hrs.
5357 Religion and Society (4) (Same as Sociology 5357.)
5710-20 Topics in Religious Thought (4, 4) Readings in Selected Languages Related to Religious Studies (3-4) Prereq: Consent of instruc- tor. May be repeated. Maximum 12 hrs.

Roman Languages

MAJORS

DEGREES

French M.A., Ph.D.

Spanish M.A., Ph.D.


College of Liberal Arts 135
Examinations: A comprehensive examination, both written and oral, covering the major and minor fields must be passed before a student can become an official candidate for the degree. This examination is to be held at the time deemed most appropriate by the student’s major advisor and committee. The candidate is expected to defend the dissertation in a final oral examination.

For additional information on the program, consult pages 19-20.

French

3010-20-30 Elements of French for Upper Division and Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language examinations, and upper division students desiring reading knowledge of the language. Undergraduate credit only. No credit for those having had Elementary French. No auditors. F; W; Sp; Su

4001-02-03 Introduction to Consecutive and Simultaneous Interpretation: French Translation (3, 3, 3) Oral translation into English; 4002—Consecutive translation to and from English; 4003—Simultaneous translation to and from English, and wide versa on variety of practical subjects such as business, economics, politics, and sciences. Given mainly in language lab with additional classroom supervision by instructor. Prereq: 3430 or equivalent. Must be taken in sequence.

4010 Masterpieces of French Literature in English Translation (3) No foreign language credit. A

4020 Masterpieces of French Drama in English Translation (3) No foreign language credit. A

4100-41-03 French Literature of the Seventeenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4150 Theatrical French (1-3) Performance in one or more French plays. Prereq: Intermediate French or equivalent and consent of instructor. May be repeated with consent of department. A

4160-70-80 Advanced Conversation (2, 2, 2) Intensive training in prepared and spontaneous conversations. Subjects range from travel and current events to literature and aspects of national culture. Prereq: Completion of 9 hrs of courses on 3000 level. F; W; Sp

4210 Phonetics (3) Prereq: 2130, 2520, or equivalent. A

4220-30 Advanced Grammar (3, 3) Prereq: 2130, 2520, or equivalent. W; Sp

4250 Introduction to Descriptive Linguistics (3) Phonetics and phonemics, morphology and syntax. Types of languages, linguistic groups, dialects and dialect geography. Application of descriptive linguistics—field linguistics, dialect study; its practical use in learning languages and in language teaching; Introduction to transformational grammar. Prereq: 9 hrs of upper division English or 9 hrs of upper division courses in a modern or ancient language of German and French 3011-20-30, 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, Russian, Spanish and Linguistics 4250.) F

4280 Introduction to Historical and Comparative Linguistics (3) Same as German, Russian, Spanish and Linguistics 4280.) W

4270 Introduction to Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into the major Romance languages. (Same as Spanish and Linguistics 4270.) Sp

4310-20-30 French Literature of the Eighteenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4350-55-70 Medieval French Literature (3, 3, 3) Medieval works in modern French texts. Prereq: Intermediate French or equivalent. A

4410-20-30 French Civilization (3, 3, 3) Prereq: Intermediate French or equivalent. A

4510-20-30 French Literature of the Nineteenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4640-50-60 French Literature of the Sixteenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4710-20-30 French Literature of the Twentieth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

5011 Techniques in Literary Analysis (3) Required for either Plan A or Plan B of M.A. program. Intensive course in explication de texte. F

5101 Foreign Study (1-12) See page 97. E

5102 Off-campus Study (1-12) See page 97. E

5103 Independent Study (1-12) See page 97. E

5100-30-30 Old French (3, 3, 3) Medieval French language and literature. A

5121 College Teaching of Romance Languages (3) Seminars, demonstrations, and practical applications of techniques and procedures for teaching and evaluating basic language skills, cultural aspects and beginning literature. 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. F

5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as Italian and Spanish 5151-61-71) S/NC only. A

5210-20-30 French Literature of the Sixteenth Century (3, 3, 3) A


5241 French Theatre of the 18th and 19th Centuries (3) Development of new dramatic forms and evolution of traditional forms in serious and comic theatre of eighteenth and nineteenth century France.

5310-20-30 French Directed Readings (3, 3, 3) E

5350-60-70 The Philosophes (3, 3, 3) Textual analysis of the works of Voltaire, Diderot, Rousseau, and other eighteenth-century writers. A

5410-20-30 The French Novel (3, 3, 3) A

5450-60 Lyric Poetry of the Nineteenth Century (3, 3) 5450—German and English influences on French Romanticism and generation of the poets of "le mal du siecle." 5450—Victor Hugo; the Parnassians. A

5470 Baudelaire and the Symbolists (3) Les Fleurs du mal and Petits poemes en prose with emphasis on theories of color and "correspondances" and their influence on Symbolist school. A

5510-20-30 Trends in Contemporary French Literature (3, 3, 3) A

5560-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in form of compositions, sketches, and original stories. A

5670 Problems in Romance Linguistics (3) Topics vary. May be repeated with consent of department. Prereq: 4270 or equivalent. (Same as Spanish 5670.) A

5710-20-30 Seminar in French Literature (3, 3, 3) Topics vary. May be repeated with consent of department. Su

5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as Spanish 5910.) A

Italian

3210-20-30 Civilization and Culture (3, 3, 3) Prereq: Intermediate Italian or equivalent. Recommended for literature majors. F; W

4010-20 Italian Drama in English Translation (3-4, 3-4) 4010—La commedia dell’arte and major works of Machiavelli, Metastasio, Alfieri, Goldini. 4020—Twentieth-century theatre; operatic drama, the Grottesco, Pirandello, D’Annunzio, Croce, Moravia. No change in credit hours after add deadline. Option of 4 hrs credit must present appropriate amount of extra work above that required for 3 hrs. A

4510-20-30 Italian Literature in English Translation (3-4, 3-4) 4510—The Commedia dell’arte and major works of Machiavelli, Metastasio, Alfieri, Goldini. 4520—Twentieth-century theatre; operatic drama, the Grottesco, Pirandello, D’Annunzio, Croce, Moravia. No change in credit hours after add deadline. Option of 4 hrs credit must present appropriate amount of extra work above that required for 3 hrs. A

4550-60-70 Dante and Medieval Culture (3, 3, 3) Readings and lectures in English for students majoring or minoring in other departments. Readings, reports, and term papers in Italian for students majoring or minoring in Italian. (Same as Comparative Literature 4550-60-70.) A

4220 Petrarch (3) Prereq: 3130, 3520 or equivalent. A

4230 Boccaccio (3) Prereq: 3130, 3520 or equivalent. A

4330 History of Italian Language (3) Prereq: 3130, 3520 or equivalent. A

4410-20-30 Literature of the Rinascimento (3, 3, 3) From Pulci to Tasso, the Quattrocento and the Cinquecento. Prereq: 3130, 3520 or equivalent. A

4530 The Modern Novel (3) Prereq: Intermediate Italian or equivalent. A

4540 The Modern Theatre (3) Prereq: Intermediate Italian or equivalent. A

4610 Contemporary Theatre (3) Prereq: Intermediate Italian or equivalent. A

4620 Contemporary Poetry (3) Prereq: Intermediate Italian or equivalent. A

4630 Contemporary Prose (3) Prereq: Intermediate Italian or equivalent. A

4760 Italian Folklore (3) Folk arts, music, traditions, rituals and lore of Italy from Middle Ages to present. (Same as Anthropology 4760.)

5011 Techniques in Literary Analysis (2) Intensive course in explication de texte. A

5101 Foreign Study (1-12) See page 97. E

5102 Off-campus Study (1-12) See page 97. E

5103 Independent Study (1-12) See page 97. E

5161-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as French and Spanish 5161-61-71) S/NC only. A

5910-20-30 Readings in Italian Literature (3, 3, 3) Topics vary and may be repeated with consent of department. A
Topics vary and may be repeated with consent of department.

**Portuguese**

3510-20 Aspects of Portuguese Literature (4, 4) Prereq: Intermediate Portuguese or equivalent. Recommended for literature majors. F, W, Sp

4310-20-30 Directed Readings in Brazilian and Portuguese Literature (3, 3, 3) May be repeated with consent of instructor. F, W, Sp

5101 Foreign Study (1-12) See page 97. E

5102 Off-campus Study (1-12) See page 97. E

5103 Independent Study (1-12) See page 97. E

**Spanish**

4030 Masterpieces of Spanish Literature in English Translation (3) No foreign language credit. A

4059-70 Hispano-Arabic Literature and Culture (3, 3, 3) A

4110-20-30 Spanish Literature of the Golden Age (3, 3, 3) The picaresque novel: Cervantes: the Comedia. A

4160-70-80 Advanced Conversation (2, 2, 2) Intensive training in prepared and spontaneous conversations. Subject range from travel and current events to literature and aspects of national culture. Prereq: Completion of 9 hrs of courses on 3000 level. F, W, Sp

4210 Phonetics (Prereq: 2130, 2520, or equivalent) F

4220-30 Advanced Grammar (3, 3) Prereq: 2130, 2520, or equivalent. W, Sp

4250 Introduction to Descriptive Linguistics (3) (Same as French, German, Russian, Linguistics 4250.)

4260 Introduction to Historical and Comparative Linguistics (3) (Same as French, German, Russian; and Linguistics 4260.) W

4270 Introduction to Romance Linguistics (3) (Same as French and Linguistics 4270.)

4410 Spanish Civilization (3) Prereq: Intermediate Spanish or equivalent. F

4420-30 Latin American Civilization (3, 3) Prereq: Intermediate Spanish or equivalent. W, Sp

4450-70 Studies in Modern Spanish Style (3, 3) Prereq: Spanish 2140-30 or consent of instructor. A

4510 Special Topics in Nineteenth Century Spanish Literature (3) Prose, poetry and theatre of Spain in the nineteenth century. Genre, movement, or combination of several literary aspects. Prereq: Intermediate Spanish or equivalent. May be repeated with consent of department. Maximum 9 hrs. A

4710-20-30 Spanish Literature of the Twentieth Century (3, 3, 3) 4710—Non-dramatic prose fiction. 4720—Drama. 4730—Lyric poetry. Prereq: Intermediate Spanish or equivalent. A

4810-20-30 Topical Survey of Spanish American Literature (3, 3) 4810—Prose fiction: major examples of the short story and novel. 4820—Poetry: landmark figures of past and present. 4830—Drama and essay: the modern period. A

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a 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

4011 Techniques in Literary Analysis (3) Required for either Plan A or Plan B of M.A. program. An intensive course in explication de texte. F

5070-80-90 Hispano-Arabic Literature and Culture (3, 3) 5070—General culture history, philosophy in Arab Spain. 5080—Development of traditional marketplace story, or epic prose narrative, into modern novel of character after invention of printing. 5090—Mutual influence of traditional Arabic poetry and popular and native Spanish choral lyric; development of classical nowashahih, the colloquial, and the vernacular. Reading in NEspana and Spanish. (Same as Arabic 5070-80-90.) A

5101 Foreign Study (1-12) See page 97. E

5102 Off-campus Study (1-12) See page 97. E

5103 Independent Study (1-12) See page 97. E

5110-20-30 Old Spanish (3, 3, 3) Medieval Spanish language and literature. A

121 College Teaching of Romance Languages (3) Seminars, demonstrations, and practical applications of techniques and procedures for teaching and assisting Hispanic literature, cultural aspects, and beginning literature. 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. F

5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as French and Italian 5151-61-71.) S/N only. E

5211-21 Don Quixote (3, 3) Must be taken in sequence. A

5212-32 Golden Age Prose (3, 3) AZeulesa: critical study of Fernando de Rojas' life and work. Celestinesque genre. Felixiano de Silva's Segundo Celestino. 5230—Guzman de Alfaro and Spanish picaresque genre. A

5250-60 The Generation of '98 (3, 3) Angel Gavirre, Giner de los Rios, Baraja, Unamuno, Valle Inclan, Benavente, Azorin, Perez de Ayala. A

5270 The Contemporary Novel (3) Civil War and post-Civil War period. A

5310-20 Directed Readings (3, 3) E

5311-21 Special Topics in Spanish or Spanish American Literature (3, 3) May be repeated. A

6340 Problems in Hispanic Culture (3) Prevaling social, political, artistic, literary and ideological conditions and patterns of any area or period within Spanish or Latin American culture. May be repeated with consent of department. Maximum 6 hrs. A

5510 Special Topics in the Spanish Theatre after the Golden Age (3) Spanish theatre from eighteenth century to present. May be repeated with department consent. Maximum 9 hrs. A

5510 Spanish American Prose to 1900 (3) Novel, short stories, and popular and native Spanish choral lyric; de

5520-30 The Modern Novel in Spanish America (3, 3) May be repeated. A

5610 Spanish American Lyric Poetry (3, 3) A

5620-30 The Modern Novel in Spanish America (3, 3) A

5631 Spanish American Essay (3) A

5632 The Spanish American Short Story (3) Short story as major literary genre in Spanish America. Reading and criticism of works of authors such as Dario, Quiroga, Borges, Arreola, and Rufio. A

5633 Twentieth-century Latin American Theatre and Film (3) Readings from works of Carlos, Solorzano, Rabodro Usgili, Conrado Nale Roxlo, Roberto Cass, Rene Marques and Sebastián Salazar Bondy. Presentation of films as adaptations of classics such as Dora Bárbara, Los de abajo and Don Segundo Sombra as well as exponents of experimental cinematica of today. A

5640 Latin American Women Writers (3) Feminine point of view, modern image of woman, male-female relationships, political context for woman’s social and popular destiny. Readings from poetry and fiction, including such authors as Alfonsina Storni, Delmira Agustini, Gabriela Mistral, Silvina Bullrich, Silvina Ocampo and Rosario Castellanos. A

5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in compositions, sketches, and original stor

5670 Problems in Romance Linguistics (3) (Same as French 5670). A

5810-20-30 Spanish Lyric Poetry (3, 3, 3) A

5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as French 5910.) A

6000 Doctoral Research and Dissertation (3-15) E

6210-20-30 Seminar in Spanish Literature (3, 3, 3) Topics vary in field of Peninsular Literature. May be repeated with consent of department. A

6310-20-30 Seminar in Latin American Literature (3, 3, 3) Topics vary. May be repeated with consent of department. A

**Russian**

See German

**Sociology**

MAJOR DEGREES

Sociology

M.A., MACT, Ph.D.

Professors: J. A. Black, Ph.D. Iowa; D. Champion, Ph.D. Purdue; L. Eberse, Ph.D. Pennsylvania; N. Shover, Ph.D. Illinois; S. Wallace, Ph.D. Minnesota.

Associate Professors: D. M. Betz, Ph.D. Michigan State; D. Clelland, Ph.D. Michigan State; D. Hastings, Ph.D. Massachusetts; T. C. Hood, Ph.D. Duke; R. G. Perrin, Ph.D. British Columbia.

Assistant Professors: C. S. Fisher, Ph.D. California (San Diego); S. Kurth, Ph.D. Illinois; K. Ritter, Ph.D. Washington; K. Van Lieren, Ph.D. Washington State.

For a full statement of departmental requirements, students are referred to the Departmental Graduate Manual. All registration for 3000- and 4000-level courses require the consent of the instructor.

**THE MASTER'S PROGRAM**

The department offers both a thesis and non-thesis option for a Master's degree. For information concerning the Master's degree with thesis, see the General Requirements on page 18. Those interested in the non-thesis option should obtain details from the department.

**THE DOCTORAL PROGRAM**

General requirements for the degree of Doctor of Philosophy are described on page 19. Additional specific requirements for the degree of Doctor Philosophy in Sociology include:

1. A minimum of 108 credit hours following the Bachelor's degree, exclusive of credits for the Master's thesis, is required. Of this number, 36 hours shall be allocated to doctoral research and dissertation. A maximum of 12 hours credit outside the major may be taken in related fields, with the approval of the student's committee.

2. A written comprehensive examination covering sociological theory, research methodology, and two other areas in sociology.
must be passed prior to admission to candidacy. This examination must be passed not later than one academic year before the date on which the degree is granted.

3. No later than one month before granting of the degree, the candidate will be required to pass an oral examination on the doctoral dissertation and a final oral examination. The candidate will be expected to show a thorough knowledge of sociological theory and methodology related to the research.

4030 Society and Law (4) General treatment of social origins and consequences of law and legal process. Particular emphasis is placed on problems of law and law-like phenomena in formal organizations. Credit. Particular emphasis is placed on problems of law and law-like phenomena in formal organizations and primitive societies.


5040 Methodological Issues in Social Research (3)

5050 Seminar in Political Sociology (3) Political system from societal, organizational, and group perspectives.

5669-70 Special Social Investigation (3, 3) Directed readings and/or research projects. E.

5125 Seminar in Environmental Sociology (3)

5200 Seminar in Collective Behavior and Social Movements (3)

5210 Social Theory (3) F

5220 Social Control (3)

5230 Seminar in Sociology of Medicine (3) May be repeated with different instructors. Maximum 6 hrs.

5251 Historical Demography (3) Family reconstitution, aggregate analysis, strategies for examining documents containing information on population. Research findings on historical patterns of change in fertility, mortality, migration and different types of family structure.

5310 Seminar in Methods of Sociological Research (3) Major methodological issues in sociology; scaling techniques; reliability, validity, sampling, and qualitative methodology.

5320-30 Social Statistics (3, 3) General survey of parametric and nonparametric procedures in analysis of sociological data; assumptions underlying procedures; advantages, disadvantages, and special applications. Must be taken in sequence. F, W.

5420-30 Social Theory (3, 3) W: Sp

5520 Crime, Law, and Social Control (3)

5530 Seminar in Community (3)

5550 Seminar on Community Power (3) Analysis of theories and methods used in studying social power in communities.

5560-70 Field Research in Deviance (3, 3)

5580 Sociology of Mental Disorders (3) Relationship between formal sociological models and substantive theories of mental illness. Historical development of theoretical conceptualizations. Interdependence of theory and therapeutic techniques. Epidemiology of mental disorders. Review of major studies.

5590 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to conflict in society, and their relationship to class structure in society.

5610 Seminar in Occupations (3) Occupations and their relation to individual and society; technology and occupations; unequal rewards and occupations; social organization and occupations.

5620 Seminar in Occupations (3) Continuation from material in Sociology 5610; interface between occupations and settings in which they are performed.

5630 Seminar in Occupations (3) Research participation; directed projects on subjects developed in 5620. Prearranged.

5640 Theories of Social Psychology (3) Current and classical theoretical perspective in social psychology. May be used for credit in psychology.

5670 Social Organization (3) Structure and function of human groups, with special attention to voluntary associations and administrative organizations.

5720 Social Interaction (3) Critical assessment, through reading and actual research, of contemporary theoretical orientations to study of small groups. Research designed to test selected theoretical problems. May be repeated. Maximum 6 hrs.

5730 Seminar in Research Problems in Inter-
The Department of Speech and Theatre offers the Master of Arts degree in Speech and Theatre with area concentrations in speech communication and theatre and the Master of Fine Arts in Theatre with area concentrations in acting and directing, playwriting, and design and technical theatre.

In their prospective concentrations at the Master's level, i.e., speech or theatre, applicants must have completed undergraduate degrees approximately equivalent in requirements to those specified for degrees conferred by The University of Tennessee, Knoxville.

The Graduate Record Examination is required of all applicants. All M.F.A. applicants must submit two letters of recommendation. Auditions before appropriate faculty are required of M.F.A. acting/directing applicants.

Applicants for admission to M.F.A. design/technical theatre and playwriting programs must submit samples of their work.

For detailed information about the graduate program, contact the Director of Graduate Studies, Department of Speech and Theatre.

MASTERS OF ARTS DEGREE CURRICULUM

The departmental requirement for the M.A. degree in Speech and Theatre is 45 quarter hours (inclusive of hours taken toward a minor), at least 24 hours of which must be earned in courses numbered 5000 or above. Only 9 hours of thesis credit (Speech and Theatre 5000) may be included in the 45-hour minimum for the degree. Speech and Theatre 5110 is required of all M.A. students.

Area concentration requirements are as follows: Speech Communication and Theatre

1. (1) Enrollment in Speech 4999 during each quarter of full-time graduate study.

2. (2) 12 hours in rhetorical and communication theory.

3. (3) 9 hours in public and interpersonal communication.

4. (4) 3 hours (not inclusive of Speech and Theatre 5110 and Speech 4999) in methods and materials in speech communication.

5. (3) 9 hours in projects courses.

MASTER OF FINE ARTS DEGREE CURRICULUM

At least 60 quarter hours, 30 of which must be at the 5000 level or above, are required for the Master of Fine Arts degree in Theatre. The number of hours each student will carry per quarter will vary with the student's concentration. The distribution of courses within the department may necessitate some students' accumulating more than 60 hours in order to earn the degree, but no student should require more than two years to finish the program. Ten to twelve hours of theatre history during the first year of residence are mandatory for all students unless appropriate undergraduate course work is evidenced. Theatre 5011-12-13 is required of all except acting students. Students will be admitted to the directing concentration only by petition after the first year of the acting/directing program is completed.

REQUIREMENTS FOR SECOND MASTER'S DEGREE

Students admitted to the MFA program who have already earned a Master's or a doctoral degree may apply up to 15 credit hours from the previous graduate program to the MFA degree, with approval of the student's committee, the Dean of the College of Liberal Arts, the Dean for Graduate Studies and/or the Vice Chancellor for Graduate Studies and Research.

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 limits (6 years) established for completion of the MFA degree.

Speech

4222 Advanced Argumentation and Debate (4)
Prereq: 2331 or consent of instructor. Sp

4461 Quantitative Research Methods in Speech Communication (4) Designing experiments; planning field studies; using statistical analysis.

4541 Rhetorical Theory and Criticism (4) Survey of Western rhetorical theory; contemporary approaches to criticism of public address. Recommended: 1211.

4560 Rhetoric of the Women's Rights Movement (4) Historical and critical study of public addresses in campaigns for women's rights from the 1830s to present. F

4571 British Oratory (4) Historical and critical study of British public address. Sp, A

4591 Persuasive Uses of Imaginative Literature (4) Topics in social and political uses of novels, plays, and poems. W

4811 Advanced Phonetics (4) Phonetic aspects of contemporary dialects of the English language. Prereq: Consent of instructor, Sp, A

4930 Studies in American Public Address (4) May be repeated. Maximum 12 hrs.

4999 Colloquium in Speech Communication (1)
May be repeated. E

5140 Communications Theory (3) Analysis of contemporary theories of human communication, emphasizing similarities and differences of communication processes in intrapersonal, interpersonal, and mass communications systems. F

5210 Topics in Group and Interpersonal Communication (3) May be repeated. Maximum 9 hrs. Sp

5220 Quantitative Projects in Speech Communication (3) May be repeated. Maximum 9 hrs. E

5440 Organizational Communication (3) May be repeated. Maximum 9 hrs. F

5550-60-70 Studies in Persuasion (3, 3, 3) W

5750-60-70 Studies in Rhetoric (3, 3, 3) F

5911 Directing the Forensic Program (4) Philosophy and methods of directing cocurricular and extracurricular cocurricular activities in high schools and colleges: competitive and noncompetitive approaches to directing debate, oral interpretation and public speaking events. (Same as Curriculum and Instruction 5911) Sp

Speech and Theatre

4170-80-90 Film History and Theory (3, 3, 3) Analysis of cinematic forms and styles. 4170- Narrration. 4180-Exposition and persuasion. 4190-Experimental forms; films and other media.
registered during any quarter when such a student...
THE DOCTORAL PROGRAM

Special requirements in Zoology are as follows: (1) course requirements shall be determined by the candidate’s faculty committee; (2) the comprehensive examination shall be oral and written examination in zoology and in allied fields in which the candidate has had training; (3) the candidate for the Ph.D. degree must possess a reading knowledge of at least one foreign language in which there exists a sizable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning at least a B in 3030 language courses. This requirement for the first language must be fulfilled before the student can take the comprehensive examination.

The student’s faculty committee may require of the student any level of training or proficiency in a second foreign language but may not require that the student take the official language examination in the second language.

3050 Comparative Vertebrate Embryology (5) Developmental morphology of selected vertebrates. 2 hrs and 3 labs. F, Sp

3060 Comparative Vertebrate Anatomy (5) Phylogeny and anatomy of organ systems. Dogfish, shark and cat primarily used in laboratory. 3 hrs and 2 labs. W


3110 General Entomology (5) Introduction to insects; basic structure, development, behavior; classification of insect orders and representative families; interpretation and use of keys. Pre-req: Biology 3130 or consent of instructor. 3 hrs and 2 labs. F

3150 Invertebrate Zoology (5) Biology of invertebrates (except insects) with emphasis on ecology and behavior. Pre-req: Biology 3130. 3 hrs and 2 labs. W

3220 Physiology of Reproduction (3) (Same as Animal Science 3220). F, Sp

3320 Histology (4) Study of animal tissues. Pre-req: Biology 3120. 2 hrs and 2 labs. F, Sp

3410 Bioethics (3) Relationship between biological discoveries and human values. Open discussion of dilemmas arising from new knowledge about medicine, behavior, resources, and technology. Sp

407, 4010-4017 Minicourse in Zoology (2 hrs each) Selected, advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for actual topics offered. Pre-req: As posted. May be repeated. E

4050 Developmental Biology (4) Experimental morphogenesis, fertilization, cellular interactions, hormonal effects and related topics with examples drawn from invertebrates and vertebrates. Pre-req: 3050. 2 hrs and 2 labs. W

4120 Undergraduate Research Participation (2) Experience in active research projects under supervision of staff members. Pre-req: Consent of instructor.

4140 Practicum in Zoology (1-3) Participation in practical application of zoology in community institutions, government organizations and industry. Approximate 5 hrs per week. Pre-req: Biology 3110, 3120, 3130 and senior standing. F, W

4190 Mammalogy (4) Classification, evolution, distribution, reproduction, populations, and behavior. 2 hrs and 2 labs or field periods. F

4200 Ichthyology (5) Classification, collection and identification, distribution, life histories, and economic importance of fishes. Pre-req: Biology 2120 or consent of instructor. 2 hrs and 2 labs or field periods. F

4210 Cell Physiology (5) Development of modern concepts in cell physiology from point of view of in-formation and communication among cells. Chemistry and integration of cellular activities. Pre-req: Cell biology, or any physiology, and organic chemistry. Recommended: Pre-req: Biology 3130 or consent of instructor. 3 hrs and 3 labs. Sp

4240 Animal Ecology (4) Environmental factors determining distribution and numbers of animals; in- and out-of-species relations; problems and methods. Pre-req: Biology 3130. 2 hrs and 2 labs. F

4250 Comparative Animal Physiology I (3) Environmental physiology. Survey of physiological mechanisms and their role in ability of animals to survive in diverse physical environments. Pre-req: Biology 3120-30 and 2 yrs chemistry. W

4259 Comparative Animal Physiology Laboratory I (1) Coreq: 4250. W

4260 Comparative Animal Physiology II (3) Sensory, effector and integrative physiology. Pre-req: 3080. Sp

4269 Comparative Animal Physiology Laboratory II (1) Pre-req: 3080 and consent of instructor. Coreq: 4260. Sp

4270 Immunology (3) (Same as Microbiology 4270.)

4280 Comparative Endocrinology (5) Comparative analysis of the physiology and morphology of endocrine glands in vertebrates and invertebrates. Their role and importance in maintenance of the organism and species. Pre-req: 3080 or equivalent. W

4290 Herpetology (4) Classification, distribution, life histories, collection and identification of amphibians and reptiles, primarily of local species. 2 hrs and 2 labs or field periods. Sp

4300 Ornithology (4) Morphology, physiology, behavior, reproduction, populations, evolution, field identification. 2 hrs and 2 labs or field periods. F

4320 Microtechnique (4) Pre-req: 3320 recommended. 2 hrs and 2 labs. F

4330 General Cytology (4) Study of cellular organization at the light and electron microscope levels and the functioning of these organelles. Pre-req: Biology 3120. Sp

4369 General Genetic Laboratory (2) Mainly Dro- sophila experiments designed to illustrate basic prin-ciples of inheritance. Pre-req: Biology 3110. W

4380 Organic Evolution (3) Modern concepts of animal evolution. Pre-req: Biology 3110. F

4390 Human Genetics (3) Principles and problems of inheritance in humans. Pre-req: Biology 2110. F

4410 General Parasitology (4) Morphology, tax-onomy and ecology of parasitic worms and protozoa, with emphasis on host-parasite relationships. 3 hrs and 1 lab. Pre-req: Biology 3130 or consent of instructor. F

4430 Medical Entomology (4) Distinctive morphologi-cal features, distribution, life histories, and control of arthropods that parasitize human or serve as vec-tors of human pathogens. Recommended pre-req: Entomology and Plant Pathology 3210 or Biology 3130.

4450 Protozoology (4) Morphology, taxonomy, and physiology of protozoa in relation to fundamental biological concepts. 2 hrs and 2 labs. Recommended pre-req: Biology 3120.

4660 Introduction to Aquatic Ecology (4) Phy-siochemical nature of inland waters. Biotic communi-ties are described, interrelationships explored. Pre-req: Chemistry 1120-20-30, Biology 3130. 2 hrs and 2 labs. F

4700 Arachnology (4) Biology of spiders, mites, scorpions, and relatives. Pre-req: 3110, or 3150. 2 hrs and 2 labs.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720.) F

4729 Comparative Animal Behavior Laboratory (1) Laboratory and in-service studies. Coreq: 4720. (Same as Psychology 4729.) F

4810-30-30 Insect Morphology and Taxonomy (4, 4) 4810—Internal morphology of both generalized and specialized forms. 4820—Taxonomy of major orders. 4830—Taxonomy of minor orders and insect families. Forma. Pre-req for 4820-30: 3110 or consent of instructor; 2 hrs and 2 labs. W; F; Sp; A

4940 Physiology of Exercise (4) Functions of body in muscular work; physiological aspects of fatigue, training, and physical fitness. Pre-req: 2920-30 or 3080. 3 hrs and 1 lab. F, Sp

5000 Thesis (1-15) E

5017 Colloquium in Ethology (1) (Same as Psychology 5017.)

5075 Zooplankton Ecology (4) Secondary productivity in aquatic systems. Pre-req: 4680 or equivalent.

5080 Graduate Research Participation (3) Advanced research techniques studied under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Pre-req: Consent of department and research director. May be repeated with consent of department. S/N/C only. E

5110-20-30 Special Problems (2, 2, 2) E

5150 Zoological Bibliography (1) Methods of locat-ing and using zoological literature, bibliographies, and abstracts, and of preparing bibliographies and scientific papers.

5160 Fresh Water Invertebrate Zoology (4) Ecol-ogy and taxonomy of fresh water invertebrates exclu-sively of insects. Laboratory and field study. Pre-req: 3150.

5210 Plant Parasitic Nematodes (4) (Same as En-tomology and Plant Pathology 5210.)

5260 Physiology of Hormones (4) Cellular and organ-ismic action of hormones in invertebrate and vertebrate animals. Pre-req: 4280. Recommended pre-req: Biochemistry 4120. 2 hrs and 2 labs.


5280 Insect Physiology (4) Functions and interrela-tionships of systems relative to metabolism, growth, coordination, movement, and reproduction. Pre-req: 4310. Pre-req: General chemistry or consent of instructor. 2 hrs and 2 labs. W, A

5290 Quaternary Problems (4) (Same as Geology 5290 and Botany 5290.)

5310-20 Seminar in the Teaching of College Zoology (2, 2) Current concepts and principles in teaching of zoology; modern techniques and instru-mentation; supervised application of teaching principles and methods. Must be taken in sequence. Pre-req: Consent of instructor. S/N/C only.

5350 Biometry (3) Statistical methods used in analysis of quantitative biological data. Pre-req: 1 qr statistics or consent of instructor. F

5360 Isotopic Methods and Techniques: Lecture (2) Theory of isotopic decay, measurement of isotopic decay by liquid scintillation counting, single and double isotope counting, applications using Ceren-kov radiation, radioimmunocassay, synthesis of meta-bolic intermediates, experimental design and data analysis. Coreq: 5389. Pre-req: Upper division laboratory course in either physiology, biochemistry, microbiology, or consent of instructor.

5389 Isotopic Methods and Techniques: Labora-tory (4) Use of liquid scintillation counter, optimiza-
tion of counting parameters for single and double isotope counting, quenching and correction, measurement of Cerenkov radiation, procedures for measuring blood volume, solute uptake into cells, radioimmunoassay of steroid hormones, hormone synthesis, synthesis of metabolic intermediates and other topics. Coreq: 5380. Prereq: Graduate standing and one upper division laboratory course in either biochemistry, physiology, microbiology or consent of instructor. Chemistry 3810 highly recommended. F

5410 Advanced Parasitology (4) Life cycles, techniques of collection, preservation, and identification of parasitic worms and protozoa. Prereq: Consent of instructor. W

5430 Advanced Medical Entomology (3) Prereq: 4430.

5510-20 Advanced Animal Physiology (3, 5) Primarily mammalian physiology; 5510—membrane neuron, central nervous system, muscle, cardiovascular system, and control mechanisms; 5520—respiratory, renal, gastrointestinal, and reproductive physiology, acid-base mechanisms, and metabolism. Should be taken in sequence if both courses are taken. Prereq: General undergraduate anatomy and physiology and Biochemistry 4110 or equivalent of consent of instructor. Biochemistry 4120 also recommended. (Same as Animal Science 5510-20). 4 hrs and 1 lab. W; Sp

5550 Advanced Ornithology (4) Classification, distribution, and anatomy of birds. Prereq: 4300.

5570 Animal Populations (3) Characteristics and methods of study of animal populations.

5610-20 Foundations of Radiation Biology (4, 4) Physical, chemical, and biological mechanisms involved in actions of different kinds of radiations on living cell and its components. Recommended prereq: 1 yr biological science, general physics, biochemistry; calculus. (Same as Radiation Biology 5610-20). 3 hrs and 1 lab.

5630 Methods of Experimentation with Laboratory Mammals (3) Designed to give competence in handling research mammals. Techniques of anesthesia, drug administration, radiography and surgery. Prereq: 4050, or 4410, or consent of instructor.

5660 Physiology of Development (3) Chemical aspects of growth, morphogenesis, and cytodifferentiation. Recommended prereq: Biochemistry 4110-20. F

5670 Cellular Immunology (4) Laboratory course with emphasis on immunological phenomena at cellular level. Preparation and use of immunofluorescent reagents, macrophage migration inhibition, skin allograft reactions, diffusion chamber cultures, and antibody formation at cellular level. 4 hrs and 2 labs.

5740 Physiological Ecology of Animals (2) Adaptive physiological responses of animals to natural changes in or extremes of physical and biotic environment. Emphasis on terrestrial vertebrates. Term paper including review of assigned topic with emphasis on creative development of special aspect. 1-2 hr. lec. Su

5760 General Vertebrate Neuroanatomy (3) (Same as Psychology 5760.)

5780 Radiation Physiology (4) Effects of different kinds of radiations on functions of cells, tissues, and organ systems of animals. Recommended prereq: 5610. (Same as Radiation Biology 5780.)

5790 Transport of Ions Across Epithelia (4) Operational principles and methods needed to study electrical and kinetic properties of epithelia and electrically excitable tissues. Quantitative methods of measuring ion fluxes and flux ratios. Prereq: Two upper-division physiology courses, graduate standing, or consent of instructor. Recommended prereq: Chemistry 3810.

5820 Methods of Taxonomy (4) Classification of animals; rules of nomenclature; problems in priority; preparation of keys, descriptions, and figures. Prereq: Consent of instructor. W

5840 Aquatic Insects (4) Taxonomy and biology of aquatic insects, emphasis on immature forms. 2 hrs and 2 labs. Sp

5850 Geographic Distribution of Animals (4) Distribution patterns of vertebrate and invertebrate animals in all major habitats. Prereq: Consent of instructor.

5870 Insect Synecology (4) Ecology of insect communities.

6000 Doctoral Research and Dissertation (3-15) E

6110 Seminar in Cellular Biology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp

6140 Seminar in Immunobiology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

6210 Seminar in Physiology (2) Prereq: Two physiology courses or consent of instructor. May be repeated. Maximum 6 hrs.

6310 Seminar in Cytology (2) Prereq: 4310. May be repeated. Maximum 6 hrs. W

6350 Seminar in Developmental Biology (2) Inter- nal regulation in differentiating cell. Prereq: 3050, 4050; Biochemistry 4110-20. W

6410 Seminar in Parasitology (2) Prereq: 5410. May be repeated. Maximum 6 hrs.

6510 Seminar in Genetics (2) Prereq: General genetics. May be repeated. Maximum 6 hrs. F

6610 Seminar in Ornithology (2) Prereq: 4300. May be repeated. Maximum 6 hrs.

6650 Seminar in Aquatic Biology (2) Prereq: Any 2 of 4200, 4660-70, Botany 5061, or consent of instructor. May be repeated. Maximum 6 hrs. F; W, Sp

6710 Seminar in Ecology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. W

6810 Seminar in Entomology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp

6910 Seminar in Radiation Biology (3) Prereq: 5610. Coreq: 5620. May be repeated. Maximum 6 hrs. (Same as Radiation Biology 6910.)
James C. Hunt, Dean
Donald C. Chase, Acting Associate Dean,
Knoxville Unit

The major campus of the College of Medicine is located in Memphis, Tennessee. The College, however, is a statewide organization with other units in Chattanooga, Jackson, and Knoxville.

In addition to Department of Medical Biology faculty listed here, the Knoxville Unit has other College of Medicine faculty and students in undergraduate and graduate medical education.

The College of Medicine traces its origin to the establishment of the Medical Department of the University of Nashville in 1851. Later, through a merger of four medical schools, it became The University of Tennessee College of Medicine and moved to Memphis in 1911.

Department of Medical Biology/Memorial Research Center

Professors:
R. D. Lange (Chairperson and Director), M.D. Washington; C. C. Congdon (Vice Chairperson and Associate Director), M.D. Michigan; W. R. Farkas, Ph.D. Duke; S. Krauss, M.D. Pennsylvania; B. B. Lozzio, M.D. Buenos Aires (Argentina); T. P. McDonald, Ph.D. Tennessee; A. Solomon, M.D. Duke; P. W. Wigler, Ph.D. California (Berkeley).

Associate Professors:

Assistant Professors:
E. W. Fuson, Ph.D. Tennessee; W. T. Hanna, M.D. Ain-Shams (Egypt); A. T. Ichiki, Ph.D. California (Los Angeles); X. D. Lin, M.D. National Taiwan (Taiwan); F. J. Miller, A.B. Alabama.

The Department of Medical Biology of The University of Tennessee College of Medicine-Knoxville Unit was formed from the faculty of The University of Tennessee Memorial Research Center and Hospital in 1978. The Research Center was established in 1956. Its faculty has education, research, and service interests in cancer, blood diseases, birth defects and clinical genetics, and biochemistry of disease. Courses in these areas are offered to students at the graduate and undergraduate levels. Elective courses are also available to students in the College of Medicine by special arrangement.

The faculty with the College of Veterinary Medicine participates in the graduate program leading to M.S. and Ph.D. degrees 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.

Courses

4210 Introduction to the Study of Cancer (3) Lectures, classroom discussion, and case reports surveying the major topics of oncology. Prereq: Biology 3110-20 or consent of instructor.

5410 Molecular Basis for Metabolic Disease (5) Metabolic disorders of humans and animals. Emphasis on molecular mechanisms in inborn errors of metabolism, toxic reactions, and deficiency states. Clinical and pathologic correlations. Prereq: Biochemistry 4110-20 or equivalent.

5420 Special Topics in Metabolic Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: 5410 and consent of instructor. May be repeated. Maximum 9 hrs.

5430 Metabolism of Drugs (2) Drug mechanisms of action: membrane transport, enzyme reactions, drug receptors, ionization, stereochemistry and metabolic pathways. For students interested in biochemical pharmacology. Prereq: Biochemistry 4110-20.

6000 Doctoral Research and Dissertation (3-15)

6110 Advanced Topics in Clinical Genetics (3) New developments in biologic research applicable to clinical medicine. Primarily for doctoral candidates in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

5220 Special Topics in Cancer (1-3) Special topics in oncology. Prereq: 4210 and consent of instructor. May be repeated. Maximum 9 hrs.

5320 Special Topics in Hematology (1-3) Special topics in clinical hematology. Prereq: 4310 and consent of instructor. May be repeated. Maximum 9 hrs.

5410 Molecular Basis for Metabolic Disease (5) Metabolic disorders of humans and animals. Emphasis on molecular mechanisms in inborn errors of metabolism, toxic reactions, and deficiency states. Clinical and pathologic correlations. Prereq: Biochemistry 4110-20 or equivalent.
a. whose undergraduate GPA is 3.0 or higher;
b. who have had at least two years of full-time clinical practice experience following completion of a baccalaureate nursing program;
c. who are Tennessee residents;
d. who are currently employed in underserved health service areas and who can demonstrate their commitment to return to those areas following completion of the program; or
e. who are currently employed as nurse educators in programs preparing registered nurses; or
f. who are currently employed as directors of nursing service.
4. Ordinarily one year of full-time clinical practice experience should be completed prior to applying for admission to the program.

DEGREE REQUIREMENTS
1. Students must complete 60 quarter hours of graduate level coursework with a cumulative GPA of 3.0 or better.
2. The 60 credit hours must include the following components:
   - Core requirement: 23 hrs
   - Clinical concentration option: 20 hrs
   - Functional concentration option: 11 hrs
   - Electives: 6 hrs
   - Total: 60 hrs
3. A Master's thesis is not required, but those students who wish to complete a thesis as part of their program may substitute the thesis for the 6 elective hours.
4. Those students who do not choose the thesis option must successfully complete a comprehensive final examination.
5. Students may choose either primary care nursing, secondary/tertiary care nursing or community mental health nursing as their clinical concentration option. Students selecting the primary care nursing option must complete 5450, 5460, 5550. Students selecting the secondary/tertiary care nursing option must complete 5120-30 (or 5140-50) and 5310. Students selecting the community health nursing option must complete 5410, 5480, 5490, 5500 and 5510.
6. The core requirement that must be completed by all students regardless of clinical option includes the following courses: 5010, 5020, 5030, 5070, 5210, 5680 and a graduate level statistics course that must be approved in advance by the student's faculty advisor.
7. Students may select a role preparation option in teaching, management or advanced clinical practice. Students selecting the teaching option must complete the 6 hours of graduate level courses in education and 5630. Students selecting the management option must complete the 6 hours of graduate level courses in administration and 5730. Students selecting the advanced clinical practice option must complete 5560 and 5660 if their clinical option is primary care, 5320 and 5340 if their clinical option is secondary care or 5520 and 5540 if their clinical option is community mental health. Except for electives, all courses taken in other colleges must be approved in advance by the student's faculty advisor.

REQUIREMENTS FOR SECOND MASTER'S DEGREE
1. Students must complete 60 hours at the graduate level (with a cumulative GPA of 3.0) unless they already have Master's or doctoral degrees. For the latter, up to 15 hours may be applied to the second Master's degree, with approval of the student's committee, Dean of the College, Dean for Graduate Studies and/or Vice Chancellor for Graduate Studies and Research.

Any hours so applied would be from courses in the first degree program that are directly relevant to the second. Students selecting the clinical concentration option must complete 5450, 5460, 5550. Students selecting the secondary/tertiary care nursing option must complete 5120-30 (or 5140-50) and 5310. Students selecting the community health nursing option must complete 5410, 5480, 5490, 5500 and 5510.
emphasize on those processes which, when altered, are mostly encountered in acute and chroni-
cd disease states. Prereq: 3210-20 or 4010 or con-
sent of instructor. Su, F, Sp

5620 Current Health Issues (2) Weekly seminar dealing with current and pending legislative, political, and community issues, concerns, and actions that have direct or indirect implications for nursing and health care delivery. Prereq: consent of instructor. May be repeated. S/NC only. E

5630 Behavioral Dynamics (3) Interviewing and communication theories utilized in nurse-client in-
tractions and therapeutic intervention; assessment and treatment of psychosocial im-
pairment and crisis states. Prereq: 16 hrs in un-
dergraduate or graduate behavioral sciences. E

5670 Theories of Nursing (3) History of nursing theory; examination of selected nursing concepts, theories, conceptual frameworks and philosophies and their relationship to nursing education and nur-
ing practices. F

5103 Independent Study in Nursing (1-4) In-depth exploration of a nursing topic of special interest to the student. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5120 Secondary/Tertiary Nursing of Adults I (6) Role of clinical nurse specialist in assisting adults and their families to maintain or restore homeostasis in clients experiencing acute illness episodes and related crises. Prereq: 5010, 5030, 5070. 3 hrs and 3 labs. F

5130 Secondary/Tertiary Nursing of Adults II (6) Continuation of 5120 with emphasis on role of clinical nurse specialist; application of theories and concepts to nursing care of hospitalized adults with emphasis on analysis and utilization of nursing and health related research findings in delivery of health and nursing care. Prereq: 5020, 5120. Prereq or coreq: 5210. 3 hrs and 3 labs. F

5140 Secondary/Tertiary Nursing of Children I (6) Exploration of role of pediatric clinical nurse specialist in assisting children and their families to optimal health; application of advanced nursing, physiological, developmental and psychosocial theories and techniques useful in assisting children and their families who are experiencing acute illness episodes and related crises. Prereq: 5010, 5030, 5070. 3 hrs and 3 labs. F

5150 Secondary/Tertiary Nursing of Children II (6) Continuation of 5140 with emphasis on role of pediatric clinical nurse specialist in assisting children and their families to optimal health; application of advanced nursing, physiological, developmental and psychosocial theories and techniques useful in assisting children and their families who are experiencing acute illness episodes and related crises. Prereq: 5010, 5030, 5070. 3 hrs and 3 labs. F

5170 Readings in Applied Physiology (3) Carefully planned library study of selected topics in physiology and pathophysiology related to various body sys-
tems. Prereq: 5100. E

5210 Applied Nursing Research (4) Utilization of research process to identify and investigate common nursing problems; critical assessment of nursing re-
search literature and development of cri-
tique of nursing research proposals. Prereq: 4440 or equivalent, graduate level statistics course. W, Sp

5310 Secondary/Tertiary Care Nursing Work I (6) Intensive clinical laboratory with opportunity to apply newly acquired nursing knowledge to more complex clinical nursing situations. Prereq: 5120-30 or 5140-50. Su

5320 Secondary/Tertiary Care Nursing Work II (9) Continuation of 5310 with emphasis on further ac-
quisition and refinement of nursing skills needed to provide high quality nursing care to acutely ill pa-
ients. Prereq: 5310. F

5340 Secondary/Tertiary Nursing Seminar (2) Identification of issues and problems involved in de-
ivery of secondary/tertiary nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect the role of nurse as secondary/tertiary clinical specialist. Coreq: 5320. Prereq: 5680. F

5410 Principles of Community Mental Health (3) Exploration of the role of the community health nurse in identifying and involving those factors or practices that impact community mental health; discussion of nursing and other mental health care provider roles within current mental health care delivery systems. W

5540 Community Mental Health Nursing Seminar (2) Identification of issues and problems involved in delivery of community mental health care; further analysis and exploration of theories and con-
cepts included in 5680 as they affect the role of nurse as community mental health clinical specialist. Coreq: 5520. Prereq: 5680. F

5640 Family Centered Primary Care Nursing II (6) Primary care nursing and health care management of individuals and families in middle and later life stages of development; application of the nursing process to management of selected episodic and chronic health problems. Prereq: 5020, 5450. Prereq or coreq: 5210. 4 hrs and 2 labs. Sp

5650 Community Mental Health Nursing: Indi-
nual (3) Application of nursing process within sys-
tems framework, to therapeutic intervention with indi-
viduals. Emphasis placed on formulation of hypotheses, testing of hypotheses, and evaluation of efficacy; study of psychopharmacological issues; analysis of special clinical problems. Prereq: 5010, 5030, 5070. 2 hrs and 1 lab. W

5660 Community Mental Health Nursing: Family (3) Application of nursing process within systems frame-
work, to therapeutic intervention with family units. Emphasis placed on formulation of hypotheses, testing of hypotheses, and evaluation of efficacy; study of psychopharmacological issues; analysis of special clinical problems. Coreq: 5010, 5030, 5070. 2 hrs and 1 lab. Sp

5670 Community Mental Health Nursing: Group (3) Study of group leadership and group dynamic theories and techniques; utilization of leadership strategies in both structured and unstructured group processes. Pre-
req: 5480. 2 hrs and 1 lab. Sp

5610 Community Mental Health Nursing Field Work I (6) Clinical practicum in a community setting providing opportunities to apply mental health nur-
sing knowledge in planned interactions with indi-
viduals and groups at primary, secondary and/or
tertiary care levels. Community and mental health systems assessment. Prereq: 5440 and 5470. Su

5620 Community Mental Health Nursing Field Work II (9) Clinical practicum for graduate student community nurse practitioner providing opportunities to apply mental health nu-
sing knowledge in planned interactions with indi-
viduals and groups at primary, secondary and/or
tertiary care levels. Community and mental health systems assessment. Prereq: 5440 and 5470. Su

5630 Community Mental Health Nursing Seminar (2) Identification of issues and problems involved in delivery of community mental health nursing care; further analysis and exploration of theories and concepts included in 5680 as they affect the role of nurse as community mental health clinical specialist. Coreq: 5520. Prereq: 5680. F

5650 Primary Care Nursing Field Work II (9) Place-
ment in selected off-campus community based de-
ivery site for purposes of applying newly acquired knowledge and developing clinical skills necessary to function as a nurse practitioner. Prereq: 5640. Coreq: 5680. Su

5660 Primary Care Nursing Field Work II (9) Con-
tinuation of 5550 with further emphasis on acquisi-
tion of critical problem solving and decision making skills to function more autonomously. Prereq: 5550. F

5670 Teaching Strategies and Practicum (5) Analy-
sis and application of curricular and teaching modi-
ities; field placement with supervised opportu-
nity to provide clinical instruction to undergraduate students. Prereq: 6 hrs approved education courses or consent of in-
structor. 2 hrs and 1 lab. F

5680 Primary Care Nursing Seminar (2) Issues and problems involved in delivery of primary nursing care; further analysis and exploration of theories and
concepts included in 5680 as they affect role of nurse as primary care provider. Coreq: 5560. Prereq: 5680. F

5680 Advanced Nursing Seminar (3) Theories of leadership, motivation, power, conflict, authority, change and decision making and their application to advanced clinical nursing practice; examination and analysis of role of nurse as health care provider and client—family advocate. Prereq or coreq: 5310 or 5550 or 5510. Su

5730 Management Strategies and Practicum (5) Analysis and application of managerial and supervisory theories and strategies; field placement in nursing service facility with supervised practice in nursing service administration. Prereq: 6 hrs approved management courses or consent of instructor. 2 hrs and 3 labs. Sp

5770 Special Topics (3) In-depth study of selected nursing topics, problems, or issues not covered in other courses. Prereq: Consent of Instructor. May be repeated. Maximum 6 hrs.
Roy F. Knight, Dean
William J. Lauer, Associate Dean

Faculty:

Professors:
Harvard; A. J. Delong, Ph.D. Pennsylvania State;
J. W. Fortey, P.E. Doctorat d'Universite de
Toulouse (France); F. Griege, M.Arch.
Pennsylvania; J. A. Kersavage, D.Sc. S. California;
W. J. Lauer, M.Arch, Engr. Iowa State;
A. J. Laster, M.Arch. Virginia; D. R. Ruth, M.Arch.
Harvard; W. S. Shell, M.S. Arch. Columbia;
L. M. Wodehouse, Ph.D. St. Andrews.

Associate Professors:
J. Burin, M.Arch., Academy of Fine Arts (Prague); A. Derman, Ph.D. Pennsylvania State; P. M. Kalos;
M.S. Tennessee; W. E. Martella, B.Arch. California
(Berkeley); M. S. Moffet, Ph.D. Massachusetts
Institute of Technology; R. T. Quinn, Ph.D. Lehigh.

Assistant Professors:
R. E. Childress, M.Arch. Pennsylvania; L. D. Grieve,
B.Arch. Tennessee; V. Narancic; B.Arch. Belgrade;
J. S. Rabun, M.A. Texas; D. A. Roberts, B.Arch. Ball
State; G. L. Sorensen, D.Ed. Texas A & M;
A. L. Wharton, B.S. Land. Arch. West Virginia;
D. L. Wooley, B. Arch. Mississippi State.

Lecturers:
A. G. Anderson, M.A. Missouri; M. C. Martin.

4031 Accelerated Historical Studies I (4) Introduc-
tion to evolution of architectural periods with
selected illustrations from local examples. Advanced
examination of relationship of historical and cultural
developments to the built environment from antiquity
through Byzantine period with applications to pre-
sent-day design issues. Independent student pro-
jects on topics related to course material. Prereq:
Admission to accelerated core program. F

4032 Accelerated Historical Studies II (4) Ad-
vanced examination of relationship of historical and
cultural developments to the built environment from
Romanesque period through neoclassicism with ap-
plications to present-day design issues. Study of his-
torical research methods and analysis. Independent
student projects on topics related to course material.
Prereq: 4031. W

4033 Accelerated Historical Studies III (4) Ad-
vanced examination of historical and cultural events
of Industrial Revolution which gave rise to modern
movement in architecture and design with applica-
tions to present-day design issues: Changing con-
cepts of ethics, aesthetics, and architectural theory.
Independent student projects on topics related to
course material. Prereq: 4031 and 4032. Sp

4170 Introduction to Preservation and Restora-
tion (4) History and theory of restoration and pres-
ervation. Sp

4175 Technology of Preservation (4) History of
technology and materials, methods and analysis and
dating, techniques of preservation. Sp

4311 Historic Preservation Laboratory (8) Directed
projects on topics related to course material. Prereq:
Consent of instructor. F

4920 Advanced Architectural Photography (4) Applica-
tion of special photographic techniques with
emphasis on color printing and processing. Prereq:
Consent of instructor. F, W, Sp

4940 Proxemics (4) Seminar for graduate stu-
dents and upper division students. Introduction to pro-
xemic research. Definition of proxemic variables. Pro-
xetic notation exercises. Analysis of etic data and the
identification of emic categories. Observer bias and
methods of bias reduction. Members of seminar re-
quired to design, conduct, and present original pro-
xemic research. Prereq: 2000 or consent of in-
structor.

4950 Environment as Code (4) Advanced lecture of
graduate students and upper division students. Ad-
vanced lecture course of theoretical issues involved in
considering environment as a medium of human com-
munication. Codes and nature of coding be-
have in animals and humans: Relationship between
coding behavior and the organization of the central
nervous system. Coding and social behavior. Com-
munication process as a general model of human
environment relations. Hierarchical aspects of en-
vironmental communications. Prereq: 2000 or con-
sent of instructor.

4731-32 Earthquake Resistant Structure I, II (4, 4)
Analysis and design of structures to resist earth-
quake effects. Earthquake phenomena. Vibration of
a single degree structural systems. Resonance and
damping. Introduction to dynamic analysis of
structures. Instrumentation and structural response.
Frame and shear wall behavior. Ground-structure in-
teraction. Prereq: Consent of instructor. (Same as
Civil Engineering 4731-32.) Su, W

4732 Structural Design for Protection Against Ex-
trreme Hazards (4) Probability, risk, human values,
insurance. Survey of possible hazards: floods, fire,
hurricanes, and tornadoes, earthquakes, nuclear
effects, internal and external explosions. Building
code and engineered design of steel, masonry, con-
crete, and wood structures to resist extreme effects.
Protective construction for human and system needs.
Fire protection engineering, fire phenomena, life safety
and analysis, high-rise building fires.

4736-37 Planning and Design of Tall Buildings (4, 4)
Architectural, economic and urban design consid-
erations in design of tall buildings. Environmental
and service systems. Wind, fire and earthquake re-
sistance. Structural and construction considerations.
Building standards. Steel, concrete, and masonry
structures. Foundations. Prereq: Consent of instruc-
tor.

4739 Aesthetics of Engineering Structures (4)
Architectural engineering; theory and utilization of
space, design, and materials in large structures.
Bridge, exhibition halls, power plants.

4850 Elementary Structural Matrix Methods (4) In-
troduction to generalized matrix methods of analysis
of structures. Review of matrix algebra and vectors;
development of member stiffness and flexibility mat-
rices; assembly of structure stiffness and flexibility
matrices. Prereq: Consent of instructor. (Same as
Civil Engineering 4850 and Engineering Science and
Mechanics 4850.) Su

4910 Architectural Photography (4) Photography
as a design, research and presentation medium.
Emphasis on architectural photography using black
and white media.

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Graduate School of Biomedical Sciences

W. E. Barnett, Director
R. J. Preston, Associate Director

MAJOR
Biomedical Sciences

DEGREES
M.S., Ph.D.

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 Doctor of Philosophy degrees. The National Laboratory, one of three installations operated at Oak Ridge by Union Carbide Corporation for the Department of Energy, is a well-known center of basic research. The school utilizes the staff and facilities of this laboratory, and thus brings directly into the mainstream of full-time graduate study in the life sciences the talent, training, and experience of that staff, as well as the most advanced research methods and technology.

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

The School is not departmentalized, and, apart from certain basic requirements, each student's curriculum is planned to meet individual needs, with the aim of giving: (1) satisfactory (B grade or better) completion of the following core courses or their equivalent: Biochemistry (5110-20); Biophysics (5140); Genetics (5160); Molecular Genetics (5170); Cell Biology (5180); Cell Biology II (5190); plus any three of the following four courses: Molecular Genetics (5170); Cell Biology (5180); Cell Biology II (5190); and Statistics for Biologists (5740). 2. Three quarters of Biomedical Sciences Laboratory (5310-20-30-40). 3. Participation in at least one of the seminars during each quarter 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. Pass both written and oral comprehensive examinations.

6. A dissertation reporting the results of original and significant scientific research. A minimum of 36 quarter hours of course 6000 is required.

7. A final oral examination on the dissertation.

8. A formal seminar presentation of the dissertation research.

SPECIAL MASTER OF SCIENCE DEGREE PROGRAM

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

Requirements for the M.S. degree are:

1. Graduate credit or a proficiency in the following core courses: Biochemistry (5110-20); Cell Biology I (5180); Cell Biology II (5190); plus any three of the following four courses: Biophysics (5140); Genetics (5160); Molecular Genetics (5170); and Mammalian Physiology (5200). Additional credits may be obtained (6 to 15 credit hours) with electives. The student will need previous training in biology, calculus, physics, organic and physical chemistry.

2. Forty-five credit hours of approved graduate courses including a minimum of 9 quarter hours for thesis (maximum 18 quarter hours of credit for course 6000). For admission to candidacy: Completion of any required prerequisite courses and one quarter of graduate course work with a B average. Admission to candidacy forms must be filed at least one full quarter prior to receipt of degree.

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

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

6. Pass a final oral (or oral and written) examination as determined by the student's committee.
Full-Time Faculty

Professors:
- D. L. Adair, Ph.D. Tennessee; D. E. Olins, Ph.D. Rockefeller.

Research Associate Professor:
- C. T. Hadden, Ph.D. Washington; E. A. Hiss, Ph.D. Notre Dame.

Shared Faculty

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


Courses

The courses below are not necessarily taught every year.

5000 Thesis (1-15 E)
5070-80 Physical Chemistry (3) Thermodynamics, phase transitions; chemical equilibria, electrostatic force, surface chemistry, electrolyte solutions, kinetics, conductance, viscosity, diffusion.
5140 Biophysics (3) Energy levels and excited states of biological systems; new experimental instrumental techniques; adaptations to system perturbations; properties of macromolecules in solution; molecular conformations; invariance in the physical principles of microscopy. Coreq: 5070-80.
5150 General Genetics (3) Mendelian genetics, mitosis, and meiosis. Transmission genetics, mapping, and linkage.
5170 Molecular Genetics (3) Molecular biology of genetic processes. Gene regulation; coding; protein synthesis; suppression of nonsense mutations; mutagen mechanisms; complementation; recombination. Prereq: 5110-20, 5160.
5200 Mammalian Physiology (4) Mammalian organ systems and their functions. Nervous, muscular, endocrine, digestive, respiratory, circulatory, reproductive, and excretory systems. Interrelationships of these systems and fundamental importance of interactions in contemporary biological research. Prereq: 5190.
5230 Biological Concepts In Medical Sciences (3) Biological mechanisms involved in physiological conditions and pathological processes of human body. Dynamic functions of organ systems; bio chemical pharmacology; hormone actions; neurobiochemistry. Current biochemical advances in basic and clinical medicine. Prereq: 5200, 5110-20.
5310-30-40 Biomedical Sciences Laboratory (3, 3, 3, 3) To acquaint students with both approaches and technologies in various areas of biochemistry, cell biology, and molecular biology. Emphasis placed on three or four laboratories conducting research in different areas of biomedical science. Required of all first-year students.
5350-60 Biomedical Sciences Seminar (1, 1) Critical analysis of current journal publications in selected area of modern biology. Written evaluation of papers and weekly oral presentations by each student. Required of all first-year students. Prereq: 5200, 5110-20.
5370 Biomedical Sciences Seminar (1) Basic principles of scientific writing. Research articles, grant and thesis proposals, abstracts, review articles, progress reports. Required of all first-year students. Prereq: 5200, 5110-20.
5430-90 Graduate Research Participation (3, 6, 9) Special advanced research project covering area not related to dissertation research. Topics chosen with consent of instructor. May be repeated.
5510-20-30-40 Special Topics in Biomedical Sciences (3, 3, 3, 3) Tutorials or formal lectures. Possible topics include x-ray diffraction and crystallography, excited-state biophysics, physical chemistry of macromolecules, pathobiology, cytology and cytogenetics, mammalian genetics, human genetics, cancer research, plant physiology, radiation biology, aging research. Additional courses developed and offered on any subject of mutual interest to individual students and staff members. May be repeated.
5740 Statistics for Biologists (3) Application and interpretation of statistical methods in data analysis. Random variational and Poisson distributions, statistical presentation of data, estimating means and variance; confidence intervals; tests of significance for comparing samples; analysis of variance; contingency tables; chi-square tests; correlation and association; linear regression. Prereq: introductory statistics or consent of instructor.
5840 Bioorganic Reaction Mechanisms (3) Nature of chemical bonds; carbonyl and electron-donating reactions, molecular rearrangements, oxidation-reduction, solvolysis, protein and nucleic acid modifications, reagents, bonds, interactions of proteins and nucleic acids on polymer supports.
5860 Cryobiology (3) Physical and chemical responses of cells and bacteria to low temperatures and ice formation. Relation of these responses to permeability, structure of semipermeable membranes, formation of macromolecules, and nature and state of water in cells; and how they bear on other fields of biology and medicine—including electron microscopy, physiology, cell physiology, exobiology, and cryosurgery. Prereq: 5070-80 or equivalent, and 5190.
5940 Classic Experiments in Genetics (3) Original papers presenting new and lasting concepts in genetics. Prereq: 5170.
6000 Doctoral Research and Dissertation (3-15)
6200 Nucleic Acid Chemistry (3) Chemistry of nucleotide-derived materials including alkylolation, solvolysis, oxidation-reduction, polymerization, synthesis, denaturation and other structure perturbations. Reaction of nucleic acids in above systems with emphasis on physical and chemical characterization of the involved reaction. Prereq: 5110-20. Coreq: 5080.
6210 Protein Chemistry and Enzyme Mechanisms (3) Theoretical and practical aspects of protein chemistry, including characterization of proteins, chemical modification of proteins, and structure-function relationships. Latter emphasizes enzymes, which includes approximation of substrates, catalysis, general acid-base catalysis, and strain and distortion of substrates. Prereq: 5110-20.
6230 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by product, substrate and deadend inhibitors; stimulation and inhibition of enzyme synthesis by feedback regulation; role of substrates in enzyme regulation; multifunctional enzymes. Prereq: 5110-20.
6251 Molecular Biology in RNA (3) RNA synthesis and metabolism in prokaryotes, RNA viruses, and their viruses. Prereq: 5110-20 or consent of instructor.
6252 Molecular Biology of DNA (3) DNA replication, repair, and recombination. Recent advances in mechanisms as related to mammalian and bacterial genetics and comparative and genetic techniques. Prereq: 5110-20 or consent of instructor.
6270 Viral Carcinogenesis (3) History of viral oncology and immunologic responses to tumor viruses. Biology of normal and transformed cells. DNA tumor viruses: replication cycle; transformation; genetics; natural history. SEGMA tumor viruses: endogenous and exogenous states; genetics, induction, transformation; natural history.
6280 Chemical and Physical Carcinogenesis (3) History and epidemics of considerations of nature and metabolism of chemical carcinogens. Radicals and site-specific carcinogenesis.
6290 Cancer Biology and Biochemistry (3) Pathology and nomenclature of cancer. Tumor immunology and immunotherapy. Biochemistry of tumor cells; enzymology, metabolism; membranes; DNA repair; regulation; strategies in chemotherapy.

6300 Mutagenesis (3) Basic mechanisms in chemical and radiation mutagenesis and dosimetry in variety of systems including bacteria, fungi, Drosophila, and mice.

6400 Membrane Biology (3) Transport kinetics, membrane biogenesis and turnover, endocytosis and exocytosis, receptor regulation, hormone-membrane biogenesis interactions. Prereq: 5110-20 and 5180-90 or consent of instructor.

6410 Techniques in Cell Biology (3) Application to specific research problems, kind of data they yield, and cautions in data interpretation. Laboratory demonstrations may be arranged where appropriate. Prereq: 5180-90 or consent of instructor.

6450 Immunology (3) Structured lectures in modern immunology and emphasis on concepts and mechanisms at the cellular level. Topics: T-B cell interaction, soluble mediators, tolerance, surveillance, transportation genetics, immunoglobulin structure. Selected laboratory exercises. Prereq: 5180-90 or consent of instructor.

6510-20-30-40 Advanced Topics in Biomedical Sciences (3, 3, 3, 3) Current and future research developments. Topics listed under Special Topics Courses, can be taken either as tutorials or as literature survey courses requiring substantial student participation. May be repeated.

6600 Mammalian Genetics (3) Orderly presentation of known genetics variants affecting each organ system of experimental mammals, especially laboratory mouse. Prereq: 5160.

6610 Mammalian Biochemical Genetics (3) Combined biochemical and genetic approaches to problems of immunology, globin synthesis, and control of enzyme synthesis. Prereq: 5110-20 and 5160 or consent of instructor.

6650 Microbial Genetics (3) Basic phenomena in microbial genetics: transduction, transformation, conjugation, and mutation. Genetics of bacteriophage. Prereq: 5160 or consent of instructor.

6750 Regulation of Intermediary Metabolism (3) Pathways involved in intermediary metabolism. Steady-state processes, "nonequilibrium" reactions, first enzymes, feedback inhibition, isozymes, multienzyme systems and compartmentation, covalent modification, positive and negative control, catabolite repression, autoregulation, stringent control, attenuation, hormonal control, other selected topics. Prereq: 5110-20 or consent of instructor.
Graduate School of Library and Information Science

Ann E. Prentice, Director

MAJOR
Library Science

DEGREE
M.S.L.S.

The Graduate School of Library and Information Science provides a program leading to the preparation of librarians and information scientists for work in all types of libraries and information centers. The program of study includes a graduate curriculum leading to the degree of Master of Science in Library Science.

MASTER OF SCIENCE IN LIBRARY SCIENCE

The goal of the program is to prepare graduates to function effectively in libraries and information centers. The program is designed to:

1. Enable students to examine critically the role and function of libraries and information centers in our society, and to define and redefine that role as the needs of society demand;
2. Enable students to understand and use the concepts and procedures related to the selection, acquisition, organization, and dissemination of knowledge;
3. Enable students to understand and apply the principles of management to the library and information center;
4. Enable students to assume individual and collective responsibility for the well-being and development of their profession and of professional service.

PROGRAMS OF INSTRUCTION

The program leading to the degree of Master of Science in Library Science involves a total of 51 quarter hours of graduate courses, 24 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis option is available, with 9 hours allowed for thesis credit. At least 36 hours must be taken in the Graduate School of Library and Information Science, allowing up to 15 hours outside the School. Upon completion of the program, all students are subject to an 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. Programs are designed for persons interested in school libraries, public libraries, academic libraries, special libraries and information centers as well as a variety of library and information related activities.

The SREB Academic Common Market applies to applicants from Arkansas, Georgia, West Virginia, and Virginia.

ADMISSION REQUIREMENTS

The minimum grade point average for admission to The Graduate School is 2.5. Candidates who have at least a 3.0 average in the junior and senior years will receive first consideration. Applicants are required to take the aptitude test of the Graduate Record Exam. The test should be taken at least one quarter in advance of application for admission to The Graduate School.

Foreign applicants are required to take the Test of English as a Foreign Language.

APPLICATION PROCEDURE

Admission to the program in The Graduate School of Library and Information Science should be made in advance of the quarter for which admission is requested. Applicants should submit the "Application for Admission" form (printed as the first page of The Graduate School Catalog) and should request the registrars of all colleges and universities attended to send two official transcripts to The Graduate School. In addition, each applicant should make arrangements to take the GRE and TOEFL exams, if applicable. A personal data sheet and three recommendations (obtained from The Graduate School of Library and Information Science) should be returned to the Director of the School.

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 extend the period required for the degree up to two years.

Similar opportunities exist with some other libraries and information agencies in the Knoxville area.

A limited number of graduate assistantships are available through the School for the degree. Assistantships of this type carry a waiver of tuition and fees as well as a stipend, and require that recipients work 10 hours per week in the School.

Information on financial assistance is available from the Director of the Graduate School of Library and Information Science.

Faculty

Professors:

Associate Professors:

Assistant Professors:
J. M. Pemberton, Ph.D. Tennessee; M. S. Stephenson, M.L.S. North Texas State.

Courses

4140 Libraries and Librarianship (3) Librarianship as an occupation: its organization, responsibilities, problems and prospects.

4150 School Library Administration (3) Objectives, functions, and place of school library; relationship to local and state services; cooperative planning for quarters and materials; evaluation. (Same as Curriculum and Instruction 4150.)

4270 Organization of Library Collections I (6) Acquisitions, cataloging and maintenance of library collections.
5320 Information Systems Analysis and Design (3) Examination and evaluation of tools and methodologies in library/information center systems planning and implementation. Role and training of systems analyst, systems study from planning through implementation and evaluation, and related topics. Prereq: 5710.

5725 Organization of Materials for Information Storage and Retrieval (3) Principles and techniques in organization and description of materials for input to information storage and retrieval systems; indexing, abstracting, document representation, thesaurus construction and maintenance, related topics. Prereq: 5710 or consent of instructor.

5730 Information Retrieval Systems Laboratory (3) Comparative capabilities of various types of information retrieval systems; analyzing performance of systems to arrive at generalizations with respect to theory, design and operation of information retrieval systems.

5750 Information Technologies (3) Computer-based and non-computer related media and methods for information storage, retrieval, and transfer within and external to library environment; existing and prototype hardware and software and interfacing of these technologies. Prereq: 5750 or consent of instructor.

5999 Practicum (6 or 9 or 12) Opportunity to translate library theory into practice under guidance of qualified librarians. Prereq: Completion of 21- hr core curriculum plus approval of director.
The Graduate School of Planning offers a two-year graduate course leading to a degree of Master of Science in Planning with concentrations in land use, transportation, environmental, regional, administrative, health, and historic preservation planning.

The purpose of study is the education of professional planners, competent to handle positions of increasing technical and administrative responsibility. Graduates are candidates for professional service in regional, city, county, and metropolitan area planning agencies; in local, state, and federal agencies concerned with physical, economic, and administrative planning; in private businesses and organizations dealing with urban problems; and in private consulting practices.

The curriculum is organized on a basis of six quarters, or 72 credit hours, and provides the student with core courses in planning theory, methods and techniques, and also takes advantage of offerings at The University of Tennessee in related fields such as government, economics, geography, civil engineering, and sociology.

Entering students follow a program of courses which provides education in the basic elements of planning. These include studies in theory, history, analytical methods, and legislation, as well as related courses in government, geography, sociology, and economics. Students are permitted to pursue particular interests through the choice of electives approved by the Graduate School of Planning. Practice in research and analysis on a particular planning problem or topic is obtained through the preparation of a thesis or major study option.

Core planning courses are taught by the faculty of the Graduate School of Planning. Related courses are taught by other specialists drawn from the University faculty. In addition, the services of experienced professional planners in TVA and other public and private organizations are called upon to broaden the scope of the students' understanding. A variety of outside speakers and seminar leaders provide insight into particular problems of significance to planners.

ADMISSION PROCEDURES

All applicants should submit two letters of recommendation with their applications. Both letters should be from teachers familiar with the applicant's undergraduate or, where applicable, graduate academic record. In the event the applicant has had planning experience, a third letter is required from a supervisor or other person familiar with the planning work of the applicant. All applicants who wish to be considered for financial assistance from the University or the Graduate School of Planning should also submit recent Graduate Record Examination scores for the Aptitude (verbal, quantitative and analytical) portion of that test. All applicants are also requested to submit a statement of career goals.

The M.S.P. degree is approved for SREB Academic Common Market participation in Arkansas, Georgia, Kentucky, and West Virginia.

All inquiries concerning admission should be addressed to: Director, Graduate School of Planning, The University of Tennessee, Knoxville, Tennessee 37916.

DEGREE REQUIREMENTS

Each student will be required to complete a minimum of 72 hours credit.

The following courses are the required core curriculum for the M.S.P. degree: 5040, 5045, 5100, 5110, 5130, 5180, 5230, 5270, 5280, 5340, 5435, 5440, 5465, 5500, Sociology 5320 or Statistics 5211. Waivers can be made by the faculty where competence is demonstrated.

Each student will be required to demonstrate competence in individual research. This may take either of two forms.

Plan I—Complete a thesis for 9 hours credit.

Plan II—Complete a major study with acceptable documentation. In order to be eligible for the major study the student must have earned a grade of B+ or higher in Research Methods II, have a 3.5 cumulative grade point at the time of approval of the major study proposal, and have completed at least 24 hours of graduate study. The student meeting these criteria may present a proposal for a major study which will include at least 9 hours of elective course work in an area of concentration. The proposal shall justify the area of study, the approach to the study, and the method of final documentation. Approval of the documentation, which must include written documentation, is a prerequisite for graduation.

Students in the Graduate School of Planning are given a comprehensive written examination after approximately four quarters of course work. In addition to testing the knowledge of the student, the information thus obtained is taken into account in advising students concerning the study program they should undertake during the balance of their academic program to remove any indicated deficiencies.

Each student will be encouraged, but not required, to complete a work internship equivalent to at least two and one-half months of full-time work in a planning agency at approximately the mid-point in course work.

Faculty


Associate Professor: G. E. Bowen, M.A. George Washington.

Assistant Professors: P. Fisher, Ph.D. Florida State; A. loebi, Ph.D. Missouri.
Courses
4100 Survey of Planning (3) History of city development and planning with special attention to the U.S. experience in urban and other levels of planning processes. Prerequisites: 5110. Review the comprehensive plan, implementation devices. Planning issues in society. Not for credit for M.S.P. degree. F

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such movement is deemed possible. Not may be used toward degree requirements. May be repeated. S/NC only. E

5005 The Planning Process (3) Identification and execution of planning process concepts. Planning and planning techniques applied in a variety of settings. Not for credit for M.S.P. degree. F, Su

5040 Communications for Planners I (1) Introduction to basic communications, interpersonal and oral communications, audiovisual equipment. F, Su

5045 Communications for Planners II (1) Graphic communications in planning. Maps and mapping, computer graphics, models and presentation graphics. Prereq: 5040. W

5050 Communication for Planners III (1) Audiovisual equipment, programmed communications, and photography used in planning. Prereq: 5045. Sp

5100 Theory of Planning (3) Analysis of nature and objectives of planning process; role of planner and planning function in public decision-making. Prereq: 5110. W

5110 Introduction to Planning (3) History of planning, familiarization with operations of contemporary planning, concept of systems, current trends and issues. Relationship between planning and society in which it occurs. Designed for PSP students. F, Su

5120 Planning Research Methods I (2) Research techniques in subject areas associated with city and regional planning. Research tools, data collection and analysis as base for planning and decision-making. F, Su

5135 Planning Research Methods II (3) Application of rigorous investigation techniques in solving planning problems, including statistical analysis and mathematical models. Urban and regional information systems as resource and tool in problem identification and solution. Prereq: 5130. W, Sp

5145 Library Research for Planning (1) Survey of publications of interest to planners, including research sources and research techniques. Use of facilities and collections of UTK library. F, W

5160 Planning and Utilities (3) (Same as Environmental Engineering 5160.)

5170 Planning for Historic Preservation (3) Planning for preservation, restoration and conservation of historic buildings, areas and sites as related to comprehensive planning process. National, state, and local government role in preservation, designation of sites, legislative needs, financing and administrative organizations.

5180 Planning Analysis and Forecasting (3) Methods of quantitative analysis and modeling in urban and regional studies. Population, employment, and economic base studies with emphasis on forecasting techniques. Prereq: 5130. W

5230 Urban and Site Design (3) Principles of design of residential subdivisions and some components of physical community such as shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience. E

5235 Urban and Site Design II (3-6) Prereq: 5230.

5270 Planning and Transportation (3) (Same as Civil Engineering 5270.) W

5280 Planning Methods (6) Tooling up studies; methods for preparation of land use and public facility elements of comprehensive development plans, including visual aspects. Prereq: 5160. W

5300 Regional Planning (3) Making planning process operative in intergovernmental context. Theories of regions and analysis of metropolitan area planning, regional planning by states, single-purpose agency planning, and TWA. Prereq: 5100. Sp

5310 State Planning (3) Evolution of planning function in state government, with emphasis on institutional environment in which planning occurs. Context and scope of state planning, and relationships with other branches and levels of government. Prereq: 5100.

5340 Implementation (3) Policy formulation, information systems, taxation, capital improvement programming, and other aspects of plan implementation. Programming public actions to affect development. Prereq: 5440. Su, F

5360 New Towns (2) Historical development of planned new towns and implications for national urbanization policy in United States; process by which new towns are created, from establishment of objectives to administration of development process and provision of public services; organizational alternatives for new town planning, development and management in context of past experience and future objectives. Prereq: 5110 and consent of instructor.

5380 Housing (3) Nature and demand for housing in U.S. and abroad with emphasis on U.S. experience. Private market processes and public influences. Problems of change in housing supply, impact of new technology, and governmental programs to improve supply and quality of housing. Prereq: 5110 or consent of instructor.

5390 Futures (3) Alternative futures and their implications for future living patterns and community planning. Techniques of future research.

5410-20-30 Special Topics In Planning (1-3. 1-3, 1-3) Lecture, group discussion, and individual research and study on specialized topics in planning not covered in depth in other courses. May be repeated. Prereq: Consent of instructor. E

5435 Planning and Government (3) Governmental context within which planning occurs. Policy making as public process. Planning structures, powers, and policies. F

5440 Planning and Land Use Controls (4) Legal basis for planning and guiding community development. Exercise of police power and eminent domain. Development and administration of zoning, subdivision controls, and related devices. Prereq: 5435. Sp

5455 Urban Revitalization (3) Goals, principles and strategies for restoring and revitalizing cities. Review and analysis of historic, current, and proposed public and private programs aimed at urban revitalization. Physical building and restoration activities as related to financial and administrative requirements. Relationship between construction oriented activities and economic and social development programs is emphasized. Prereq: 5110 or consent of instructor.

5460 Planning Administration (2) Planning agency management, program development, and agency finance. Prereq: 5435.

5465 Planning and Property Development (3) Process of urban physical growth and change with emphasis on functioning of private sector real estate development and its relationship to planning. Partnership roles of public and private sectors in urban development and redevelopment. Prereq: 5440.

5500 Synthesis (9) Problem-oriented experience to integrate knowledge from previous courses. Interrelationships stressed; student required to use judgment in evaluation and creation of plans and policies addressed to real world situations. Extensive laboratory experience. Prereq: Required planning courses or consent of faculty. F, W

5670 Social Planning (2-3) Theory, philosophy and implications of programs for planned social change. Consideration of major social planning issues in diverse fields of service: aging, corrections, education, health, social services. Prereq: Consent of instructor. (Same as Social Work 5670.)
Graduate School of Social Work

Ben P. Granger, Dean
Betty J. Cleckley, Associate Dean
Lou M. Beasley, Branch Director, Knoxville
M. Kate Mullins, Branch Director, Memphis
Roger M. Nooe, Branch Director, Nashville
Ronald K. Green, Director, Office of Continuing Social Work Education

MAJOR
Social Work

DEGREE
M.S.S.W.

The University of Tennessee School of Social Work is a fully accredited two-year graduate professional school, with a program (thesis or non-thesis option) leading to the degree of Master of Science in Social Work. The full two-year curriculum is offered in all three branch locations.

GRADUATE PROFESSIONAL EDUCATION

The School of Social Work has as its primary objective the education and training of persons for leadership in the social welfare profession and the social work practice community. Leadership roles include positions in social welfare administration, social planning and policy development, and positions as treatment team leaders, supervisors, consultants, and expert practitioners.

Central to professional leadership are a commitment to the values and goals of the profession and a developed capacity for self-awareness and self-discipline. The experience of a graduate professional education builds commitment, and the School's program guides students into independent, analytical thought and prepares them to use their skills and knowledge to effective purpose.

The School of Social Work recognizes and enjoys the challenge of cultural pluralism in society and encourages applications for admission from minority group members. Through the planned inclusion of significant and pertinent racial and ethnic content in the curriculum, the School provides students with the educational background needed to take creative roles in the social work profession's efforts toward the elimination of racism and such other social ills as poverty, crime, neglect, and social injustice.

A special bulletin describing the facilities, admission, fees, and degree requirements is obtainable from The School of Social Work, 2014 Lake Avenue, Knoxville, Tennessee 37916.

AREAS OF PROFESSIONAL PRACTICE

Specializations within the School's curriculum prepare students for social work careers in such practice fields as criminal and juvenile justice systems; family and child welfare services in public and voluntary agencies; group services in neighborhood and community centers; health services; mental retardation; public welfare services; mental health services; rehabilitation services; school social work; and social gerontology.

THE PROFESSIONAL CURRICULUM

The School of Social Work's curriculum is designed to provide the student with the basic components of professional competence through a progression of course work and supervised practice experience. Students may elect a thesis or non-thesis option. The two-year, six-quarter program includes a core curriculum, a specialization in one of two areas—social work treatment or social welfare administration and planning—and concurrent field practice.

The Core Curriculum

The core curriculum is offered during the first two quarters of the first year and is required of all students. It is a 30-quarter-hour sequence of five basic courses. As the initial phase of the School's educational program, the core curriculum contributes to the process of socialization and professional identification, and presents students with a comprehensive and broad knowledge base from which to operate in the future as practitioners and administrators.

Credit Hours

| Fall Quarter, First Year | 5070 Social Work Research I | 3 |
| 5110 Social Welfare Policy and Services I | 3 |
| 5210 Human Behavior and Social Environment I | 3 |
| 5410 Social Work Practice I | 3 |
| 5910 Field Practice | 3 |
| TOTAL QUARTER HOURS | 15 |
| Winter Quarter, First Year | 5080 Social Work Research II | 2 |
| 5120 Social Welfare Policy and Services II | 3 |
| 5220 Human Behavior and Social Environment II | 3 |
| 5420 Social Work Practice II | 3 |
| 5920 Field Practice | 4 |
| TOTAL QUARTER HOURS | 15 |
| Spring Quarter, First Year | 5930 Field Practice | 4 |
| Specialization Courses and Electives | 10 |
| TOTAL QUARTER HOURS | 14 |
| Fall Quarter, Second Year | 5940 Field Practice | 8 |
| Specialization Courses or Electives | 2 or 3 |
| TOTAL QUARTER HOURS | 10 or 11 |
| Spring Quarter, Second Year | 5950 Field Practice | 8 |
| 5961 Integrative Seminar | 2 |
| One Elective | 2 or 3 |
| TOTAL QUARTER HOURS | 12 or 13 |

AREAS OF SPECIALIZATION

Social Work Treatment

Social work treatment deals with those individual, family, and group methods utilized to enhance the social functioning of individuals and effectively ameliorate problems of social dysfunction. The specialization attempts to develop a thorough 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

Social welfare administration and planning deals with the design, implementation, and continued operation of effective programs for client service. Specifically, the method deals with the assessment of client characteristics, development of environmental resources, design of effective organizational structures, management, staff development, program evaluation, social planning, neighborhood and community development, financing, and coordination of services.

Field Practice

Field practice is a critical component of the student's first- and second-year program. Because The UT School of Social Work cooperates with a wide range of social agencies and human service programs in the State of Tennessee and areas immediately adjacent to the State, the School is able to provide field placements in a variety of social work practice areas. The faculty works closely with the placement agency and the student to insvide that the student has a quality field practice experience which meets the objectives of the core curriculum and the specialization.

The first-year curriculum is on a concurrent class and field plan, with students engaged in classroom study two or three days per week and in field practice the remainder of the week. First-year agency placements are selected to provide the student with practice experiences related to the core curriculum content and beginning specialization. Within the placement, each student's experiences are planned and designed according to the educational needs.

In the second year, students are engaged full time in classroom courses during the fall quarter. The winter and spring quarter plan consists of a block field placement of four days per week and an accelerated field practice course each quarter. Second-year placements are selected according to the student's area of specialization, individual career interests, and educational needs. The student actively participates with the field practice coordinator and the specialization committee in selection of the second-year placement. The second-year field practice experience focuses on the integration of social work knowledge and skills, and emphasizes the acquisition and development of full practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over variations in holidays and office hours for the student.

DEGREE REQUIREMENTS

1. Satisfactory completion of the curriculum.
2. All courses taken as part of the degree programs, whether taken within the School of Social Work or outside, must be acceptable for graduate credit relevant to social work and to the student's career objectives, and have the approval of the student's faculty advisor.
3. Achievement of a B average on all work presented for the Master's degree.
4. Completion of each required course at a satisfactory level (a grade of C or above). Graduate courses may not be repeated to raise a grade.
5. Students who elect a thesis must pass an oral examination conducted by a faculty committee.
6. Students who elect a non-thesis option must pass a written comprehensive examination.
7. Credits to be counted toward the degree must be earned within six years from the beginning date of the earliest course applied toward the degree, except in cases where permission to update courses has been granted.
8. The minimum number of credit hours required for a degree shall be 79 hours including a maximum of 36 S/NC hours.
9. Performance at a satisfactory level in field practice, which is designed to teach professional practice skills.

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 student'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 the average to be admitted on supplemental evidence of ability to perform at a satisfactory level.
3. Personal qualifications acceptable for entrance into the professional practice of social work.
4. Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences.
5. Applications should be filed no later than March 1 for the year in which admission is desired.

THE ADMISSIONS PROCESS

Individuals who wish to be considered for admission should obtain the required application materials from the Office of Admissions, UT School of Social Work, 2014 Lake Avenue, Knoxville, TN 37916, telephone (615) 974-3175, or one of the Branch offices. Admission to the School of Social Work is determined within the students' academic offerings. Students are admitted on the basis of evidence presented for the Master's degree.

1. Have achieved a 3.0 or above grade point average (on a 4.0 scale) in undergraduate work.
2. Have completed an undergraduate major in social work from a program accredited by the Council on Social Work Education, or an undergraduate major in a related area which included a supervised field practice component, or have completed at least two years of full-time employment in social work practice.
3. Pass a qualifying examination administered by the School of Social Work faculty in early spring.

The accelerated programs begin either in the Memphis Branch in March or in the Nashville Branch in June with an intensive ten-week term from which students proceed in the fall into the regular second-year curriculum. Application for admission to the accelerated program is through the regular admission process. Applications should be filed not later than December 31 for the Memphis program and not later than January 31 for the Nashville program.

PART-TIME STUDENTS

Courses in the regular curriculum of the School are open to persons who meet the admission requirements for full-time study and who are planning to complete the work for the degree within the next two or three years. Application should be made to the School in the regular way, but the applicant should inform the Director of Admissions of the wish to begin part-time study on a planned basis.

TRANSFER CREDITS

Courses completed in another accredited graduate school of social work are usually accepted for The University of Tennessee School of Social Work degree requirement providing the applicants meet the admission requirements of The Graduate School and The University of Tennessee School of Social Work, and if previous courses are equivalent to required or elective courses offered here. The University of Tennessee School of Social Work allows a maximum of 45 credit hours of graduate course work from another accredited institution to be transferred into the student's Master's program. Such work must...
have been taken for graduate resident credit and those who have repeated. In addition, it must be part of an otherwise satisfactory graduate program (B average) and be approved by the branch director and the dean. This course work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

Graduate students majoring in fields other than social work are admitted to certain social work courses with the approval of the School of Social Work and the student's major professor.

Faculty

Professors:

B. P. Granger (Dean), Ph.D. Brandeis; M. H. Bloch, M.S.W. Ohio State; R. C. Bonovich, D.S.W. Washington; G. W. Fryer, Eliz. Columbia, G. McLaran (Emeritus), M.S.S.W. Tennessee; M. K. Mullin, Ph.D. Chicago; A. M. Noe, D.S.W. Tulane; B. Orchard (Emeritus), M.S.W. Western Reserve; S. W. Spencer (Emeritus), M.S.W. New York School of Social Work.

Associate Professors:

G. W. Ayers, D.S.W. Tulane; L. M. Beasley, Ph.D. Denver; W. J. Bell, D.S.W. Tulane; B. J. Cieckley, Ph.D. Brandeis; D. W. Dunlop, D.S.W. Tulane; J. C. Eades, Ph.D. Southern Illinois (Carbondale); R. W. Falcon, Ph.D. City University of New York; M. Feil, Ph.D. The Hebrew; J. H. Garnier, M.S.S.W. M.S.S.W. Columbia; C. F. Hairston, Ph.D. Western Reserve; H. Hirayama, D.S.W. Pennsylvania; P. D. Kurz, Ph.D. Michigan; P. Landon, Ph.D. Denver; E. K. Marshall, Ph.D. St. Louis; A. E. Moses, D.S.W. California (Berkeley); R. B. Rowen, Ph.D. Arizona; H. Rubenstein, Ph.D. Chicago; D. A. Smith, M.S.W. Simmons; P. Tate, Ph.D. Tennessee; P. Vanrooyen, H. Vaugn, M.S.S.W. Tennessee; A. R. Wachtler, M.S.S.W. Tennessee; C. S. Wilke, Ph.D. St. Louis; P. G. Zarbock, M.S.W. Wisconsin.

Assistant Professors:

J. R. Cates, Ph.D. Michigan; M. Catingog, Ph. D. Washington; J. Charing, M.S.S.W. Tennessee; J. C. Collier, M.S.W. Tulane; H. P. Coyle, Ph.D. Western Reserve; C. C. Faut, M.S.S.W. Tennessee; A. R. Ford, M.S.W. California; V. A. Gault, M.S.W. Tennessee; W. D. Harrison, Ph.D. Minnesota; K. Hirayama, D.S.W. Pennsylvania; J. F. Jankovic, Ph.D. Rutgers; D. C. Johnston, M.S.W. California (Berkeley); J. R. Michell, M.S.W. Ohio State; D. Parker, M.S.W. Loyola; P. L. Pogge, Ph.D. Tulane; D. Parker, M.S.W. Strong; M.S.S.W. Tulane.

Courses

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15)

5083 Directed Readings in Research (2-4) May be repeated with approval of instructor. Maximum 4 hrs. F, W, Sp

5090 Special Problems in Social Work (2-9) Individual study or research on problems of special significance to student or under supervision of major professor. May be repeated. F, W, Sp

5110 Social Welfare Policy and Services I (3) Interests of social work profession in development of contemporary social policy at local, state, national, and international levels of organization. Contribution social work professionals can make to policy-making process through which macro social change is effected, and through which aggregate social welfare services are proposed, authorized, financed, and programmed. Policy lab may be used to focus on beginning skill development. F

5120 Social Welfare Policy and Services II (3) Examination of theories of complex organizations applied to social welfare service delivery settings. Transformation of collective social welfare resources into indivisible and individual social welfare benefits through organized institutional action of professional nature. W

5130 Social Policy Analysis (2-3) "Policy science" techniques used to order and analyze extraordinary events in assessing social, political, and economic implications of social policy proposals. Prereq: Completion of core or consent of instructor. Maximum 6 hrs. F

5161 Social Welfare Seminar (2-3) Problem area or field of practice seminar focusing on substantive knowledge about social problem or condition and interrelated social problems. Prereq: Completion of social policy, social welfare policy, and social work practice. Fields such as health, mental health, child and family welfare, mental retardation, education, corrections, housing, labor force development, income maintenance, and aging. Prereq: Completion of core or consent of instructor. May be repeated. Maximum 9 hrs. W, F

5210-20 Human Behavior and Social Environment I and II (3, 3) Examination of theories pertaining to individual, family, and small group within context of functional, structural, roles and processes. Behavior of these systems conceptualized along functional abnormality and normative continua. Organizing themes, development and maturation, adaptive and defensive mechanisms. Open system approach used to understand interaction of psychological, biological, and social variables with emphasis on implications of culture and ethnicity. F, W

5280 Special Accelerated Program in Social Work (1-15) This program provides qualified students with intensive academic and field practice experience that qualifies them to enter second year of graduate study upon successful completion of this term. S/NC only.

5310 Human Behavior and Social Environment (2-3) Deepens and extends students' knowledge of range of adaptive behaviors, from optimum social functioning through pathology. Prereq: Second-year status may be repeated.

5311 Imaginative Perspectives on the Human Condition (2-3) Examination of usefulness to social work students of prosc, drama, and poetry, which illuminate and expand knowledge and appreciation of every person's humanness. Adaptive and maladaptive responses to extraordinary life situations and events, portrayed by creative writers. Artistic representation of molding of human personality and socialization of person with one another and with society. Prereq: Completion of core or consent of instructor.

5312 Psychopathology and Social Deviance (2-3) Theories of and recent research in atrophy of physical dysfunction and social variance. Categorical approach to psychopathology examined and differentiated from other approaches to human behavior. Prereq: Completion of core or consent of instructor.

5313 Deviant Behavior of Children and Youth (2-3) Deviant behavior and conduct disorders in children and youth, etiology, symptomatology, and repercussion in society. Prereq: Completion of core or consent of instructor.

5314 Comparative Theories of Personality (2-3) Those personality theories with most relevance for social work practice with individuals, groups, or families. Prereq: Completion of core or consent of instructor. Taught at branches only. Available at UT Knoxville by Psychology 4516.

5315 Human Sexual Problems (2-3) Desensitization and desensitization of personal and social attitudes toward sexual behavior, clinical problems and approaches to make social workers better able to deal with clients with sexual problems. Prereq: Completion of core or consent of instructor.

5316 Mental Health and Employment (2-3) Work as major life task and value, attitudes toward work, patterns of employment, effect of changing technologies on individual and community, interdependence of individual and organization, meaning of work in assessing mental health. Prereq: Completion of core or consent of instructor.

5317 Social Work and Black Families (2-3) Historical and contemporary theories regarding Black families, emphasis on Black family and community frameworks to assess and plan for Black families within service delivery systems. Prereq: Completion of core or consent of instructor.

5410 Social Work Practice I (3) Basic theory values and beginning skills development generic to social work intervention at various system levels. Combines classroom skills and laboratory experiences. F

5420 Social Work Practice II (3) Assessment, planning, methodology and skills development fundamental to social work intervention. Combines classroom skills and laboratory experiences. W

5440 Family Therapy in Social Work Practice (2-3) Application of practice theory to assist in acquisition of skills in treatment of family as unit. Prereq: Completion of core or consent of instructor. W

5441 Transactional Analysis (2-3) Philosophy, theory, and therapeutic technique of transactional analysis. Lectures, discussion, and experiential methods facilitate acquisition of knowledge and skills to use transactional analysis as treatment modality. Prereq: Completion of core or consent of instructor.

5442 Short-term Treatment (2-3) Theory and practice of short-term treatment focusing on nature of models characterized by rapidity of approach, and designs of programs providing short-term treatment services. Specific techniques of assessment and treatment of individuals in crisis. Prereq: Completion of core or consent of instructor. W

5443 Seminar on Behavior Therapy (2-3) Behavior modification methodology applied to clinical assessment, choice of design, structured treatment interventions, skill in evaluating data on effectiveness of treatment interventions. Prereq: Completion of core or consent of instructor. W

5460 Social Work Treatment with Individuals and Families (3) Social work literature, social casework as method of social work practice and as form of interpersonal treatment. Prereq: Completion of core or consent of instructor. Sp

5470 Contemporary Treatment Modalities: Individual and Family (2-3) Well established, newly developing, and developing treatment modalities in terms of essential concepts. Differential facetics and theory-based approaches. Prereq: Completion of core or consent of instructor.

5480 Special Topics in Social Work Treatment (2-3) Treatment with individuals, families, and small
5560 Social Work Treatment with Groups (2-3) Development of knowledge and skill in use of group methods in social work practice, organization and formulation of group, structuring group tasks and experiences, understanding and enhancing group functioning, enabling problem-solving effectiveness, facilitating group decision making, and evaluating individual change and group effectiveness. Prereq: Completion of core or consent of instructor. Sp

5561 Interpersonal Skill Development (2-3) Training designed to enhance interpersonal competence in application of human relations skills in social work practice. Prereq: Completion of core or consent of instructor. W

5600 Comparative Methods of Group Treatment (2-3) Comparative analysis and critical review of theory and methodology of some of major group treatment modalities with emphasis on theory-base, leadership, techniques and procedures, and research. Prereq: Completion of core or consent of instructor. A

5601 Social Work in Rural Communities (2-3) Characteristics of rural populations and rural community analysis. Outline and analysis of rural social services and delivery systems. Development of social work knowledge and occupational function in rural areas. Prereq: Completion of core or consent of instructor. W

5602 Community Organization (2-3) Using behavioral and social science knowledge about communities and of organizations to assist in development of resources to meet human needs. Prereq: Completion of core or consent of instructor. Sp

5603 Social Planning (2-3) (Same as Planning 5670) Planning and management of change in social welfare agencies. Prereq: Completion of core or consent of instructor. Sp

5604 Interpersonal Skill Development (2-3) Training designed to enhance interpersonal competence in application of human relations skills in social work practice. Prereq: Completion of core or consent of instructor. W

5607 Planning and Management of Change in Social Welfare (2-3) Theories and models of change such as planned change, conflict, and evolutionary change in relation to organizational change, community improvement, locality development, and economic development related to social welfare services. Prereq: Completion of core or consent of instructor. F

5608 Administration in Social Work (2-3) Introductions to administrative practice as it relates to social work purpose and values and development of administrative principles that make possible effective pro- provision of social services. F

5609 Organizational Design of Social Welfare Agencies (2-3) Critical problems of adapting organizational structure and operational patterns to tasks, objectives, and mandates. Planning and design techniques for new programs and for modification of existing programs to appropriate deployment of resources and personnel for maximum effectiveness and efficiency. Integration of theory and experience for development of practical skills for coping with variety of situations. Prereq: Second-year administration or community organization students; consent of instructor; 5761 or equivalent. Sp

5741 Supervision in Social Work (2-3) Dual roles of supergroup, structuring group and supervision distinguished from consultation and from direct practice. Responsibility and accountability to client system, supervisee, and executive, problems of middle management position of supervisor. Differences and similarities in supervision of varying levels of personnel, tasks, techniques, and processes in relation to individual and group supervision and field instruction. Prereq: Second-year status or consent of instructor. W

5742 Consultation in Social Work (2-3) Consultation in social work. Prereq: Second-year status or consent of instructor. W

5743 Management of Human Resources in Social Welfare (2-3) Personnel function in administration of human services programs and agencies. Personnel recruitment, selection, appointment, and supervision; staff development, training, and evaluation; salary and benefit systems; employer-employee relations; and motivation. Prereq: Completion of core or consent of instructor. W

5744 Education and Training in Social Welfare (2-3) Philosophies and practices of teaching and learning related to adults in social work and social welfare. Distinctions between teaching and learning; training and education; unique aspects of adult learning; measurement issues; models and styles of education. Prereq: Completion of core or consent of instructor. W

5745 Professional Leadership in Social Work (2-3) Leadership in social welfare. Theories of leadership; complexity of leadership; function, effectiveness, and qualities of leaders; leadership styles, values, motivation and morale; and leadership development and training. Prereq: Completion of core or consent of instructor. W

5746 Social Welfare Administration and Planning (3) Topics significant to managerial-planner role such as decision making, budgeting, planning, and programming. Prereq: Completion of core or consent of instructor. Sp

5747 Seminar in Social Welfare Administration and Planning (3) To assist students in acquiring specific and general techniques appropriate for social welfare delivery systems. Prereq: Completion of core or consent of instructor. Sp

5750 Financial Management for Social Welfare Administration (2-3) Centralized decision making related to allocation of scarce resources in social services organizations. Technical aids to budgetary choice and other aspects of financial management examined for utility, parsimony, and feasibility. Prereq: Completion of core or consent of instructor. F

5800 Management of Residential Settings (2-3) Issues and trends in management and programming in residential institutions for children, aged, mentally ill, mentally retarded, juvenile delinquents, adult offenders, and other groups. Prereq: Completion of core or consent of instructor. F

5812 Organizational Perspectives in Juvenile Justice (2-3) Aspects of juvenile justice system: overview of juvenile delinquency, introduction to theories of causation, role of police in detecting delinquency and apprehension of delinquent offenders, police procedures, role and strategies of alternatives to institutions, correctional institutions, aftercare programs, and preventive strategies. Prereq: Second-year standing.

5820 Social Aspects of Illness (2-3) Social, economic, and emotional problems arising from or related to illness and disability as they affect individual, family, and community. Services needed to obtain optimum results from medical care. Lectures, discussion, illustrative case material. Sp

5825 Drugs: Use and Abuse (2-3) Survey and analysis of social, cultural, medical, and psychological factors underlying alcoholism and drug abuse, recent research and treatment innovations, social work with users and their employment. Prereq: Completion of core or consent of instructor. Sp

5830 Law and Social Work (2-3) Basic principles of law which relate to social work practice; organization of courts; legal aid societies; and other problems of legal nature that affect social work. Sp

5850 Social Gerontology (2-3) Physical, psychological, and social aspects of aging; economic and health status of aging; older person and family; community programs for aging; retirement—phenomenon of modern society. Sp

5855 The Roles of Women (2-3) Roles and statuses of women: emphasis on contemporary American scene. Empirical research as well as popular literature. Ascribed and achieved facets of women's statuses. A

5910-20 Field Practice (3, 4) Instruction and supervised practice in methods of social work with individuals, groups and communities. Prereq: Admission to the School; 5140 concurrently or prior to 5910; 5420 concurrently or prior to 5920. Must be taken in sequence. Required course. S/NC only. F; W

5930-40-50-60 Field Practice (4, 4-8, 4-8, 4-8) Specialized instruction and supervised practice methods of social work treatment, administration, and planning in community health and welfare programs and agencies. Prereq: Admission to the School. Must be taken in sequence. S/NC only. Sp; W; Sp

5951 Integrative Seminar (2) Required seminar facilitates integration of two-year M.S.S.W. program; attention given to current issues in profession and to pressing social problems. Student participation in symposia, discussions, simulations, and gaming situations prepares graduating student to assume positions of responsibility and leadership within professional social work organization. Graduating student helped to plan toward continuing his/her education and professional development. S/NC only.

5970 Outcomes in Social Work Practice (2-3) Application of substantive knowledge to comprehensive problem-solving within existing service and community systems. Critical appraisal of functional relationships between problem, policy, planning, practice, and outcomes. Examination of problems from practice to determine key elements of optimal services and implications for policy decisions. S/NC only.

5990 Practicum in Governmental Social Welfare Policy Making (2-3) Practical introduction to progress of legislative and/or administrative policy making at state or local governmental level, through assignment of students to offices of elected or appointed policy makers. Limited social welfare policy research activities. Seminar to present normative and descriptive theory about policy-making process, and models of policy analysis. Prereq: 5110 and consent of instructor. May be repeated.