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 Station is the activity of the Agricultural Experiment Station (AES), which is one of the main divisions of the Institute of Agriculture. The AES is responsible for conducting research and developing new knowledge in various areas of agriculture. The AES also plays a crucial role in disseminating knowledge to the public through various channels, such as Extension Services.

The Agricultural Extension Service (AES) was established in 1914 to extend educational and technical information to farmers, families, and others in Tennessee. The AES operates through a network of county Extension offices located in all 95 counties in the state. Each county has a County Agent who is responsible for managing the Extension program in that county.

The AES provides a wide range of services, including agricultural and home economics education, resource development, and home management. The AES also provides information on a variety of topics, such as crop production, animal husbandry, soil and water management, and home economics.

The AES is funded by a combination of state and federal funds, and it receives support from the state and federal governments. The AES is administered by the Institute of Agriculture, and it operates under the direction of a County Agricultural Extension Committee, which represents the state, county, and federal governments.

The AES has a long history in Tennessee, and it has made significant contributions to the state's agricultural development. The AES has been instrumental in developing new knowledge and technology, and it has played a crucial role in disseminating this knowledge to the public. The AES has been a key partner in the state's agricultural development, and it continues to play a vital role in supporting and advancing the state's agricultural sector.
Forestry and Wildlife and Fisheries Science, and minors are available in 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 major professor and Master's committee in consultation with 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:

1. 48 hours of course work of which 32 hours must be at the 5000-level or above.
2. 18 hours in agricultural economics.
3. 9 hours of economic theory.
4. 6 hours in quantitative methods in agricultural economics, statistics, or mathematical economics.
5. Final comprehensive written and oral examination.

Requirements of the non-thesis option for the Master of Science degree with a major in Forestry are as follows:

1. 50 hours of course work of which 34 hours 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. In addition, the College of Agriculture requires:

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 specific program of a candidate for the Doctor of Philosophy degree in the College of Agriculture will depend upon the interest and previous training of the candidate. Each candidate will be under the immediate supervision of 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.
4. 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:

1. Agricultural policy
2. Agricultural marketing and price analysis
3. Farm management and production economics
4. Natural resource economics
5. Rural development
6. The course requirements:
   a. Agricultural economics
   b. Economic theory
   c. Mathematical and quantitative methods in agricultural economics

Additional Course Requirements: 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

Concentrations:
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: 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 research and dissertation. A minimum of 24 quarter hours shall be taken in departments outside of the Department of Agricultural Engineering.

Animal Science

Concentrations:
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 Course Requirements:
1. A minimum of 24 quarter hours credit must be completed in related fields outside of animal science.
2. At least 36 quarter hours credit in courses at the 5000 and 6000 level, exclusive of Doctoral Research and Dissertation. At least 9 of the 36 hours must be in 6000-level courses.

Food Technology and Science

Concentrations:
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 Course Requirements:
1. At least 36 quarter hours credit in courses at the 5000 and 6000 level, exclusive of Doctoral Research and Dissertation. At least 9 of the 36 hours must be in 6000-level courses.
2. A minimum of 9 hours of courses for graduate credit outside of the Department of Food Technology and Science.

Plant and Soil Science

Concentrations:
1. Soils
2. Plant breeding and genetics
3. Crop physiology and ecology

Supporting studies are required in related sciences fundamental to the training of the candidate.

Departments of Instruction

Agricultural Economics and Rural Sociology

MAJOR

Agricultural Economics

DEGREES

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. Cieland, Ph.D. Wisconsin; I. Dubov, Ph.D. California (Berkeley); L. H. Keller, Ph.D. Kentucky;
T. H. Klindt, Ph.D. Kentucky; F. O. Leuthold, Ph.D. Wisconsin;
D. L. McLemore, Ph.D. Clemson;
B. R. McNanus, Ph.D. Purdue; D. B. Sappington, Ph.D. Illinois.

Associate Professors:
B. J. Trevena, Ph.D. Tennessee; D. Mundy, Ph.D. Michigan State;
L. H. Keller, Ph.D. Illinois.

Ph.D. Washington State.

Assistant Professors:
B. J. Trevena, Ph.D. Tennessee; B. J. Trevena, Ph.D. Tennessee;
D. N. Walker, Ph.D. Oklahoma 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

4120 Farm Management (3) Principles of farm organization and operation; nature of managerial processes; economic aspects of crop, livestock, labor and machinery planning; use of budgeting techniques; field trips arranged. Prereq: Agriculture 1110 and Economics 2120. 2 hrs and 1 lab. F, W

4140 Agricultural Production Economics I (3) Application of microeconomic theory to problem of resource allocation, product selection, scale of operation of agricultural firms; economic interpretation of technical agricultural production relationships. Prereq: Agriculture 1110 and Economics 2120. W

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 local action programs. Case examples from the U.S. and other countries. Prereq: Agriculture 1110 and Economics 2120, or consent of instructor. Su

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

4320 Agricultural Policy (3) Meaning of agricultural policy in democratic society; relationship of farm groups and problems given rise to policy; agricultural policy and appraisal of results; policy problems. Prereq: Agriculture 1110 and Economics 2120. F

4330 Land Economics (3) Problems and policies of land use, conservation, development, taxation, and 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 data and economic theories for decision making. Prereq: Agriculture 1110 and Economics 2120. Sp

4630 Advanced Agricultural Marketing (3) Economics of market location and pricing; perfect market model; spatial equilibrium analysis; production and marketing of farm commodities; transportation and storage costs; maximizing returns, institutions and market flows; measuring efficiency. Prereq: 3120 or 3520 or consent of instructor. W

5000 Thesis (1-15) P/NP only. 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) S/NC only. E

5130 Agricultural Production Economics II (3) Theoretical and empirical concepts of agricultural allocation problems under various knowledge situations with emphasis on uncertainty. Aggregate external effects of decisions made by individual agriculturalists and group decision-making to agriculture. Prereq: 4140 or equivalent. Sp

5210 Seminar: Agricultural Policy (3) Sp

5220 Research Methodology (3) Nature of scientific method, logic, philosophy, assumptions, potential and limitations of science; methodological problems and ethical considerations; field trips. Prereq: Consent of instructor. 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 S/NC only. F

5410 Agricultural Marketing Analysis (3) Analysis of structure, conduct, and performance of agricultural marketing system; application of price theory concepts and forecasting models used to examine industry conduct and performance. Prereq: Economics 3110 or consent of instructor. Sp

5420 Advanced Land and Natural Resource Economics (3) Economic efficiency in natural resource allocation; issues in project and policy evaluation. Prereq: 4330 and Economics 5110, or consent of instructor. F

5440 Economics of Agricultural Development (3) Role of agriculture in overall economic development; impacts of world food situation on people, environment, development; natural and human resources for food production; technology and change; national and international food policy. Prereq: 4240 or consent of instructor. W

5460 Quantitative Methods in Agricultural Economics (3) Analytical techniques used in estimating functions—supply, demand and production—and prediction of economic variables. Emphasis on application of multiple regression: model specification, estimation technique using computer and interpretation of results. Prereq: Statistics 4310 or Economics 5510 or consent of instructor. W

5710 Linear Programming (3) Techniques with empirical applications to problems of firm and region; maximizing firm profit, minimizing firm costs, transportation, risk, space and time. Prereq: Consent of instructor. F

5820 Agricultural Price Analysis (3) Application of various research methods to analysis of price structures; specification and estimation of price determination models and interpretation of results. Prereq: 3120 and 5610 or Statistics 4310 or consent of instructor. Sp

6000 Doctoral Research and Dissertation (3-15) P/NP only. 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. Fr, Sp

6210 Agricultural and Rural Transformation Problems (3) Systematic evaluation of policy and development proposals related to agricultural modernization, food supply and rural living. Deciding making process and useful roles of social scientists. Analysis of current issues in U.S. and developing nations. Prereq: 4140 or equivalent. Sp

6410 Agricultural Supply Analysis (3) Estimating agricultural supply relationships using aggregate time series regression, production functions, linear programming, simulation and firm 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. Prereq: 5410 or consent of instructor. W

Rural Sociology

3420 Rural Sociology (3) Nature of rural society; social system concept; rural-urban differences; nature of social relations; population characteristics and movement; problems of rural people; tenancy, farm labor, health services, educational facilities, churches, local government; impact of industrialization. F, W, Sp

4450 Diffusion of Agricultural Technology (3) Analyses the impact of innovation and technological change as it spreads from scientists to final adopters. Adaption 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

4300 Seminar in Rural Sociology (3) Current rural sociological literature and research; relevance of general sociological theory and methodological techniques. Prereq: 3420 or equivalent. F

4549 Advanced Rural Sociology (3) Application of sociological concepts to analyze 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

4709 Research Problems in Rural Communities (3) Emphasis on problems that arise in survey research in rural areas. Sampling procedures, questionnaire construction, interviewer selection, training, control, and legitimization needs. Prereq: Undergraduate course in statistics. Sp

5490 Rural Population Analysis (3) Analysis of U.S. and world population changes and determinants of fertility, mobility, and migration with emphasis upon changes in rural sector. Prereq: Sociology 4110 or equivalent. W

Agricultural Engineering

DEGREES

MAJORS

Agricultural Engineering

AGRICULTURAL MECHANIZATION

M.S., Ph.D.

Agricultural Mechanization

M.S.

Professors:

D. H. Luttrell (Head), Ph.D., Iowa State; B. L. Bledsoe, Ph.D., Oklahoma State; Z. A. Henry, Ph.D., North Carolina State; J. J. McCow, Ph.D., Michigan State; J. I. Sewall, Ph.D., North Carolina State; E. L. Sherman, M.S., Virginia Polytechnic Institute.

Associate Professors:

F. D. Tompkins, Ph.D., Tennessee; L. R. Wilhelm, Ph.D., Tennessee; E. O. Baxter, M.S., Missouri.

Agricultural Engineering

5340 Special Problems (3) Topics in Agricultural Engineering (3) Develop new topics as required by current trends and problems in agricultural engineering.

5410 Design of Water Control and Waste Utilization Systems (3) Earth dams, irrigation, drainage, leach lagoons, hydraulic structures, water management, application of wastes on agricultural land. Prereq: 3610 or consent of instructor. 1 hr and 2 labs. W

5420 Design of Structures for Production, Processing and Environmental Control (3) Functional planning and structural design of agricultural buildings; emphasis on complete design of structure or system, functional, structural and environmental aspects. Prereq: 3620. 1 hr and 2 labs. Sp

5430 Design of Processes 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. Prereq: 3640 or consent of instructor. 1 hr and 2 labs. Sp

5000 Thesis (1-15) P/NP only. E

5240 Environmental Control in Agricultural Structures (3) Engineered physical facilities to control temperature and plant life; basis for development and design of facilities and structures for confined housing of animals, controlled environ-
Agriculture

5120 Teaching Internship in Agriculture (1) Supervised experience in teaching, test preparation, and evaluation of agriculture students. May be repeated. Maximum 3 hrs for M.S. students; 6 hrs for Ph.D. students.

Animal Science

MAJOR

DEGREES

Animal Science

Professors: D. O. Richardson, (Head), Ph.D. Ohio State; K. M. Barth, Ph.D. Rutgers; M. C. Bell, Ph.D. Oklahoma State; J. K. Slater (Emeritus), Ph.D. Ohio State; W. T. Butts, (Adjunct), Ph.D. Tennessee; C. C. Chamberlain (Emeritus), Ph.D. Iowa State; C. H. Haig (Dean), Ph.D. Iowa State; S. L. Hansard (Emeritus), Ph.D. Florida; E. B. Littrell, M.S. Tennessee; J. B. McLaren, Ph.D. Auburn; G. M. Merriman (Emeritus), D.V.M. Michigan State; M. J. Montgomery, Ph.D. Wisconsin; R. Murdock (Emeritus), Ph.D. Wisconsin; H. V. Shirley, Ph.D. Illinois; R. R. Sloane, Ph.D. Iowa State; E. W. Swanson, Ph.D. Missouri; R. Tugwell (Emeritus), Ph.D. Missouri; C. E. Wilie (Emeritus), A.M. Missouri.


Assistant Professors: W. C. Cullen, Ph.D. Minnesota; R. N. Hellmann, Ph.D. Maine; H. E. Kattesh, Ph.D. Virginia Polytechnic Institute; T. W. Schultz, Ph.D. Tennessee; J. D. Smalley, Ph.D. Texas A & M.

3210 Anatomy and Physiology of Farm Animals (4) Skeleton and joints, skeletal muscles, blood and microcirculation, and the nervous, cardiovascular, respiratory, digestive and endocrine systems; demonstrations of physicochemical phenomena. Prereq: Biology 1210 or Agriculture 1130. 3 hrs and 1 lab. F, W, Su

3220 Physiology of Reproduction (3) Comparative anatomy and physiology of reproductive systems of higher vertebrates; gametogenesis, fertilization, implantation, prenatal growth, parturition and initiation of lactation; endocrine regulation of reproductive phenomena. May be repeated. Maximum 1 credit. Prereq: Consent of instructor. (Same as Zoology 3220.) 2 hrs and 1 lab. F, W, Su

3320 Animal Nutrition (3) Properties, functions, utilization and deficiency symptoms of essential nutrients; nutritive value determinations and their use. Prereq: Agriculture 1130 and one quarter of organic chemistry. F, W

3330 Foods and Ration Formulation (4) Feedstuffs, additives, feeding standards, nutrient requirements and ration formulation for beef and dairy cattle, sheep, horses, swine and laboratory animals. Prereq: 3320. 2 hrs and 2 labs. W, Su

3410 Heredity in Animals (3) Basic chromosomal mechanisms of heredity, Mendelian principles and exceptions such as linkage and cytoplasmic inheritance. Introductions to the biochemical basis of heredity and to quantification of inheritance. Illustrations of principles related to species familiar to agriculture students. Prereq: Agriculture 1130. 2 hrs and 1 lab. F, W, Su

3420 Principles of Animal Breeding (3) Genetic principles in the improvement of economic species. Genetic basis of variation. Partitioning of variation according to various kinds of causative differences such as those in genetic makeup and environment. Selection and its consequences. Mating systems and their effects on populations. Prereq: 3410 or equivalent. 2 hrs and 1 lab. F, Su
3510 Animal Hygiene and Sanitation (4) Parasitic, viral and bacterial organisms in farm animals; immunization; control and protection against disease; veterinary regulations and quarantine; herd health programs. \( Q \) Microbiology 2910-11 or 2910-19 or consent of instructor. 3 hrs and 1 lab. F, W, Sp.

3520 Avian Diseases (3) Major diseases; characteristics, prevention and treatment, management practices. \( Q \) Veterinary \( Q \) Microbiology. 5 hrs and 1 lab. Sp, A.

3810 Nutrition and Management of Laboratory Animals (3) Principles of feeding, breeding, and handling of animals in scientific investigations; specific species' requirements, peculiarities, and research for which best fitted. Laws governing use and handling of laboratory animals. Prereq: Agriculture 1130 and consent of instructor. 2 hrs and 1 lab. W, F.

4210 Physiology of Lactation (3) Development, anatomy, and function of mammary glands; endocrine interactions for mammary development and milk secretion; factors affecting yield and composition of milk. Prereq: 3210. W.

4220 Avian Physiology (3) Anatomy and physiology of avian species with emphasis on poultry. Prereq: 3210. 2 hrs and 1 lab. Sp.

4230 Applied Reproduction in Farm Animals (3) Application of principles and techniques in collecting, evaluating, processing, and preserving semen; insemination of females; pregnancy determination; genetic testing and analysis; male and female infertility. Prereq: 3220 and consent of instructor. 1 hr and 2 labs. Sp, F, A.

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

4340 Experimental Animal Nutrition Laboratory (2) Demonstrate feeding systems and animal nutrition concepts including preparation and feeding of experimental diets. Prereq: 3330. W.

4810 Beef Cattle Production and Management (4) Principles of nutrition, physiology, and breeding in a complete beef cattle management program. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives in terms of production 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. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives in terms of production response and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, W.

4830 Pork Production and Management (4) Integration of principles of nutrition, physiology and breeding into a complete pork production management program. Structure of industry, systems and practices of production, production practices and herd improvement programs, traits, equipment and facilities for both pleasure owners and commercial producers. Alternatives in terms of production, recreation and economic returns. Prereq: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, W.

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

5000 Thesis (1-15) \( P/NP \) only. E.

5011 Problems in Lieu of Thesis (1-6) May be repeated. Maximum 6 hrs. S/NC only. 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 reproduction; hormone preparation for altering growth and reproduction of farm animals. Prereq: 3210 or consent of instructor. 2 hrs and 1 lab. W, A.

5230 Advances in Mammary Reproduction (3) Germ cell development, maturation, transport metabolism, and factors influencing genetic and environmental 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 maintenance of lactation. Prereq: 4210. 2 hrs and 1 lab. Sp, A.

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


5333 Nonruminant Animal Nutrition (4) Physiological development and changes in digestive system of nonruminant animal during the life cycle. Concepts and methodology concerning nutrient requirements, interrelationships, availability and deficiencies of nutrients. Nonnutritive additives, toxins, poisons, and disease effects; nutritional effects on productivity. Prereq: 3210, 3330 or consent of instructor. 3 hrs and 1 lab. W.

5344 Ruminant Animal Nutrition (3) Digestive physiology of the ruminant stomach, rumen fermentation, determination of nutrient requirement and feed intake regulations of ruminant animals. Prereq: 3330. F.

5410 Genetics of Animal Populations (3) Population and individual, gene and zygotic frequencies, statistical descriptions of populations; forces influencing 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) Advanced animal physiology (primarily mammalian physiology). \( 5510 - \) Membrane neuron, central nervous system, muscle, cardiovascular system, and control mechanisms, 5520—Respiratory, renal, gastrointestinal, and endocrine systems, acid base mechanisms, and metabolism. Should be taken in sequence if both courses are taken. Prereq: General undergraduate zoology and Biochemistry 4110 or equivalent consent of instructor. Biochemistry 4120 also recommended. (Same as Zoology 5510-20.) 4 hrs and 1 lab. W, Sp.

5710 Methods of Evaluating Experimental Data in Animal Science: From Design of Experiments to Statistical Inference (3) Techniques derived from statistical analyses. Prereq: Statistics 2511 or equivalent. 2 hrs and 1 lab. W.
Food Technology and Science

MAJOR

DEGREES

Food Technology and Science

M.S., Ph.D.

Professors:

J. T. Miles (Head), Ph.D., Wisconsin; J. L. Collins, Ph.D., Maryland; H. O. Jaynes, Ph.D., Illinois; C. C. Melton, Ph.D., Kansas State; W. W. Overcast (Emeritus), Ph.D., Ohio State; Associate Professors:

B. J. DaMott, Ph.D., Michigan State; S. L. Melton, Ph.D., Tennessee; M. J. Reimann, Ph.D., Kansas State.

Assistant Professors:

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

5000 Thesis (1-15) P/NP only. E

5100 Research Methods and Instrumentation in Plant Pathology and Entomology (3) Techniques for field, laboratory, and greenhouse research in plant pathology and entomology. 1 hr and 2 lab. F

5110 Plant Disease Diagnosis (3) Diagnosis of plant diseases, disease symptoms, causal agents and control measures. Prereq: 3130. W, A

5120 Insect Diagnostic Clinic (3) Identification of insects and insect damage to crops, livestock and residences. Obtaining of insects and damaged specimens; diagnostic characteristics and control measures. Prereq: 3210 or Zoology 3110.

5210 Plant Parasitic Nematodes (4) Morphology, physiology, taxonomy, and ecology of plant parasitic nematodes with emphasis on host-parasite relationship. Prereq: 8 hrs biological science or consent of instructor. 8 hrs and 2 lab. W, A

5220 Plant Disease Control (3) Basic problems and principles involved in controlling plant diseases. Prereq: 3130 or equivalent course in applied entomology. 2 hrs and 1 lab. F, A

5240 Plant Virology (4) Symptomatology, etiology and epidemiology of virus infection; structure, morphology, replication, transmission, purification, characteristic, and classification of plant viruses; serology; plant pathogenic viroids, mycoplasmas and virophages. 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 anthropod 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 entomologic. May be repeated. Maximum 3 hrs. F, W, Sp

5130 Food Enzymology (3) Commercial and native enzymes in manufacturing, processing, and apportionment 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 profile. Prereq: 4210. 3 hrs and 1 lab. W

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. F, W, Sp

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

5420 Advanced Food Quality Assurance (3) Application of current instrumental methods used to control food 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: 3840. 2 hrs and 1 lab. Sp, A

5530 Microorganisms Common in Food Products (3) Identification of desirable and undesirable microorganisms in food products and relationship to manufacturing operations. Isolation and characterization of microorganisms in foods and equipment. 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 foods. Prereq: 4810 and Microbiology 3810. 2 hrs and 1 lab. Sp, A

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6010 Advanced Topics in Food Technology and Science (1) Selected readings, discussions and presentations of current topics; topics to be announced in advance. May be repeated. Maximum 6 hrs. S/NC only, F, W, Sp

6410 Advanced Food Processing (3) Role of processing treatments in modification of food properties; texture, color, and flavor characteristics. Prereq: 5210, 5410, and Food Science 5510 or consent of instructor. 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 protection; development of management programs with consent of instructor. Two overnight field trips. W

4210 Forestry Organization and Administration (3) Planning, organizing, and leadership concepts and cases; 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 as integration of resource uses; review of traditional timber-management concepts; 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; producing multiple services; preparation of a complete plan based on optimizing forest uses. Prereq: 4210 Sp

4240 Interpreting Forest Resources (3) Principles and techniques of interpreting forest resources; importance of environmental interpretation to management of forest resources; development and administration of interpretive services. Possible overnight field trips 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 photographs in forest-resource management; interpretation of detail, aerial inventories, preparation of cover-type maps, uses of other remotely sensed imagery. Prereq: 3110 or equivalent. 1 hr and 2 labs. Sp

4420 Forest Tree Improvement (3) Forest tree improvement related to silviculture; nature and purposes of tree improvement and forest genetics; principles of tree cytology and population genetics; importance of seed source; 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

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; socio-economic 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 Environments (3) Review of sociological and psychological theories relevant to forest recreation planning, management, and implementation. Implication and application of behavioral concepts to forest recreation problems; review of methodologies for assessing recreational behavior. Prereq: 4240 and 6 hrs in behavioral psychology and/or sociology, or consent of instructor.

4540 Wood Drying and Preservation (3) Concepts of wood drying and preservation, wood moisture content, specific gravity, moisture content, density, and shrinkage. Commercial drying practices. Relationship of wood preservatives to attack by wood-destroying organisms. Methods and materials used in commercial treating systems. Prereq: 3210, 4006, 4007 Sp

4580 Seminar in Forest Biometry (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. W

5011 Problem Analysis in Forest Resources (3) Problem identification, analysis and solution in forest resources management. Emphasis on the application of ecological principles to contemporary problems. Prereq: 8 hrs of biology, botany, or zoology. F

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

5220 Seminar in Forest Tree Biology (3) Growth, current problems, and 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

5240 Seminar in Forest Genetics (3) Population genetics and speciation, variation patterns and heritability in forest trees, and use of genetics for forest improvement. Techniques for isolation and analysis of genetic factors. Prereq: 4420, Biology 3110, and consent of instructor. W

5250 Recreation Planning for Forests and Associated Lands (3) Planning process for recreation development on forests and associated lands; analysis and critique of specific contemporary plans. Overnight field trips may be required. 2 hrs and 1 lab. F

5260 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

5310 Seminar (3) Current developments in forestry. Required of each graduate student in residence Winter Quarter. May be repeated. Maximum 2 hrs. S/NC only. W

Wildlife and Fisheries Science

5320 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

4450 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 population dynamics; age and growth. Prereq: Biology 3130, 8 hrs mathematics, or

Graduate credit for non-forestry and non-wildlife sciences majors only.


Assistant Professor: E. F. Dougall, Ph.D. Oregon State.
consent of instructor. 3 hrs and 1 lab or field period.

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

5000 Thesis (1-15) P/NP only. E

5110 Special Problems in Wildlife and Fisheries 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. Prerequisites: 3620 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 6 hrs. Sp, A

5400 Advanced Topics in Wildlife Science (3) Recent advances and concepts, research techniques, and analysis of current problems. Prerequisites: 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 differences in the field and lab. Investigative procedures concerning wildlife diseases. Prerequisites: 1yr zoology, 1qt microbiology, 1qt parasitology, 4450 or 4460, or consent of instructor. 2hrs and 1 lab. Sp, A

5460 Predator Ecology (3) Dynamics of terrestrial vertebrate predator populations in human-altered and relatively unaltered environments. Principles of predator biology and management. Prerequisites: 4450 and 4460 or equivalent and Zoology 4240. W, A

5500 Advanced Topics in Fish Science (3) Recent advances and concepts, research techniques, and analysis of current projects. Prerequisites: 4450 or consent of instructor. May be repeated. Maximum 6 hrs. Sp, A

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

Ornamental Horticulture and Landscape Design

MAJOR

Ornamental Horticulture and Landscape Design

DEGREE

M.S.

Professors:

Associate Professors:

Assistant Professor:
D. T. Kendal, MLA Louisiana State.

*3030 Plant Propagation (3) Physiology, methodol- ogy, and environmental requirements for propaga- tion. Prerequisites: 8 hrs of biological science. 2hrs and 1 lab. F

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

3620 Intermediate Landscape Design (4) Applica- tion of skills such as design of landscape projects. Requirements of graphic skills. History of landscape design relates to contemporary applica- tions. Techniques associated with design and imple- mentation. Use of plant materials in the design of small and moderate scale landscape situations. Prerequisites: 3610, 3610 or equivalent. 1 hr and 2-1/2 hrs. F, W

3630 Landscape Construction and Contracting (4) Construction methods, materials and practices of landscape installation and contracting. Site layout procedures and arbor- ture and drainage, landscape drainage and construction materials; application through actual de- sign drawings and in field-scale projects. Landscaping contracts, specifications and bidding procedures. Prerequisites: 3310, 3610; Agricultural Mechanization 2130 recommended. 1 hr and 2-3/4 hrs. Sp

4150 Nursery Production (4) Modern methods of producing liners, field and container grown woody ornamental plants. History and evolution of nursery industry and modern production recommendations for woody ornamental plants. Prerequisites: 3030, 3810 and Plant and Soil Science 2130. 2 hrs and 2 labs. F, Sp

4160 Nursery Management (3) Modern manage- ment methods for wholesale and retail nurseries. garden centers, and landscape contractors. Prerequisite: 3310, 2 hrs and 1 lab. W

4180 Park Design (4) Design criteria for parks and outdoor recreation systems. Park site selection, analysis, and related improvement as related to the design of parks and their impact on the environment of rural and suburban communities. Prerequisite: 3860. 2 hrs and 2 labs. Sp

4190 Advanced Landscape Design (4) Compre- hensive application of landscape design skills and knowledge through development of major project. Analysis, programming, planting design, construc- tion detailing, estimating, specifications, contracts and bidding. Prerequisites: 3510, 3620, 3630, 3 hrs and 2-3/4 hrs. Sp

4220 Advanced Turfgrass Management (4) Prin- ciples and scientific basis of turfgrass culture: adapta- tion, ecology, physiology, sod cultivation 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. Prerequisites: 3210: 3 hrs and 1 lab. W

4320 Specialty Floriculture (3) Specific practices in production, propagation, and marketing of shrub and greenhouse crops. Production methods for scheduling flowering or vegetative growth of specialty florist crops in con- trolled environments. Prerequisites: 3410. 2 hrs and 1 lab. Sp

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

5000 Thesis (1-15) P/NP only. E

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

5210 Golf Course Design, Development, and Management (4) Principles and applications in des- ign, development, and management of golf courses. Selection and utilization of grass varieties and other plant materials and development of specifica- tions for nutritious, chemical, and mechanical maintenance. Financing, equipment, labor manage- ment, and budgeting. Prerequisites: 4240 and consent of instructor. 2 hrs and 2 labs. Sp

5310 and Public Grounds Management Systems (4) Design criteria affecting management sys- tems requirements. Protection and cultural care of trees, shrubs, grassland plants. Prerequisites: 4240 and public grounds management systems and specifications. Maintenance programs. Prerequisites: 4180 or consent of in- structor. 2hrs and 2 labs. F

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

5500 Seminar (1) Current literature and develop- ments in ornamental horticulture and landscape de- sign. May be repeated. Maximum 3 hrs. F, Sp

5510 Advanced Nursery Production (4) Prepara- tion and use of growing media for woody ornamental plants; nutrition of ornamental plants including di- agnosis, prevention and control of mineral de- ficiencies; development of fertilization programs for containers and field grown ornamentals. Prerequisites: 4150; Plant and Soil Science 3110; Botany 3210 or Plant and Soil Science 3040. 3 hrs and 1 lab. W

Plant and Soil Science

MAJOR

Plant and Soil Science

DEGREES

M.S., Ph.D.

Professors:
L. F. Steatz (Head), Ph.D. North Carolina State; F. F. Bell (Emeritus), Ph.D. Iowa State; D. L. Coffey, Ph.D. Purdue; B. V. Jones, Ph.D. North Carolina State; H. A. Fribourg, Ph.D. Iowa State; L. S. Jeffery, Ph.D. North Dakota State; L. M. Josephson (Emeritus), Ph.D. Washington State; R. D. Purdus; J. H. Reynolds, Ph.D. Wisconsin; L. N. Skold, (Emeritus), M.S. Kansas State; M. E. Springer (Emeritus), Ph.D. Colorado State; H. D. Swingle (Emeritus), Ph.D. California (Berkeley). The faculty is augmented by visiting and guest lecturers.

Associate Professors:
F. L. Allen, Ph.D. Minnesota; A. V. Krueger, Ph.D. Illinois; D. A. Lettke, Ph.D. Michigan State; G. M. Lamken, Ph.D. Michigan State; R. C. Lewis (Emeritus); Ph.D. North Carolina State; V. H. Reich, Ph.D. Iowa State.

Assistant Professors:
J. S. Bybee, Ph.D. North Carolina State; R. J. Miller, Ph.D. Texas A & M; D. R. West, Ph.D. Nebraska; J. D. Wolf, Ph.D. Auburn.

3020 Crop Ecology (3) Crops and crop production, geographic location; soil, heat, light, water and inter- plant relationships as a basis for judgment of cultural practices used to modify environmental factors. Prerequisites: 8hrs biological science. 2hrs and 1 lab. Sp

3040 Crop Physiology (3) Biology of crop plants; growth phenomena related to crop production; use of general theories of physiology; effects of environment; growth requirements of light, heat, air, minerals and water. Prerequisites: 8hrs biological science. 2hrs and 1 lab. W

3110 Soil Fertility and Fertilizers (4) Properties of soils in relation to fertility and related availability and up- take. Methods of soil fertility evaluation and princi- ples of fertilizer use; manufacture and properties of fertilizers. Prerequisites: 2130. 3 hrs and 1 lab. W

3120 Grain and Oil Crops (3) Distribution, improve- ment, morphology, culture, harvesting, and utiliza- tion of corn, small grains, grain sorghum, soybeans and related crops. Prerequisites: 2130, 8hrs biological science. 2hrs and 1 lab. W

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

3160 Cotton and Tobacco (4) Characteristics, adaptation, improvement, culture, harvesting, and related use of cotton and tobacco. Prerequisites: 2130, 8hrs biological science. 3hrs and 1 lab. F, Sp

3180 Fruit Crops Management (4) Soil, planting, cultivation, development of fruit crops plantations; pest control, harvesting, packing, storage, and prun- ing. Prerequisite: 3010; Plant and Soil Pathology 3130 or 3210. 3hrs and 1 lab. W

Clyde B. Austin Distinguished Professor.
3220 Soil Management (4) Soil management for crop production including cropping systems, fertilizers, utilization of water and other resources for specified soil and farming conditions. Prereq: 2130. 3 hrs and 1 lab. F, 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. Soil properties of importance in road location, recreational use, and watershed management. Prereq: 2130, Forestry 3320. 2 hrs and 1 lab. W.

3510 Commercial Production of Cool Season Vegetables (3) Characteristics, economic importance, adaptability, and production for fresh and processed markets; emphasis on greens, salad, cole, root, bulb crops, perennials, and Irish potatoes. Prereq: 3 hrs biological science. 2 hrs and 1 lab. Sp.

3610 Interpretation of Agricultural Research (3) Statistics as applied to agriculture. Statistical methods in interpretation of research results. Prereq: Mathematics 1550. F, W.

3710 Principles of Weed Science (4) Basic principles of weed science, historical, ecological, economical losses, means of control, types of herbicides, and specific recommendations for various crops and non-crop areas. Prereq: 3 hrs biological sciences 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 processes to plant nutrient availability. Prereq: 2130 and Physics 1210. 3 hrs and 1 lab. F.

4120 Principles of Crop Breeding (4) Genetic principles and techniques used in crop improvement. Prereq: 3 hrs biology, chemistry or science of instructor. 3 hrs and 1 lab. W.

4250 Agricultural Chemicals and the Environment (4) Characteristics, use of mode of 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. Prereq: 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. Prereq: 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) P/NP only. E.

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

5200 Soil Crop Relationships (3-6) 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. Planning and evaluation of specific soil management programs. Prereq: 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. Prereq: 4320 or consent of instructor. 3 hrs and 1 lab. W, A.

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

5340 Soil Physics (3) Chemical and physical relationships among soil, liquid, and gaseous phases of soil management. Prereq: 4110. 2 hrs and 1 lab. W.

5370 Advanced Soil Fertility (3) Fundamental concepts and principles of soil biology as they relate to nutrient absorption by plants; interactions of these concepts in soil fertility and management. Prereq: 4110. W, A.

5390 Soil Physical Chemistry (3) Structural properties of soil minerals determining physicochemical reactions, ion exchange. Donnan Equilibrium, double layer theory. Prereq: 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; controlled mutations; induced mutations, genome organization, polytomic, tetrasomic inheritance, extrachromosomal inheritance, aponix, incompatibility systems, and genetic engineering of higher plants. Prereq: Basic genetics or consent of instructor. F, A.

5720 Quantitative Genetics (3) Genetic constitution of populations; measurement of genetic diversity; recombination, estimation of gene frequencies; analysis and measurement of continuous variation; estimation of variable components and genetic advance using different breeding procedures. Prereq: Basic genetics or consent of instructor. W, A.

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. Prereq: 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. Prereq: 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 physiology and ecology. Interrelationships between physiological processes and environmental factors. Crop adaptation to specific environmental conditions. Prereq: 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) P/NP only. 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. Prereq: 5310. F, A.

6510 Growth Control with Chemicals (3) Character, theories of action and use of auxins, gibberelins, cytokinins and inhibitors. Range of effects on growth. Prereq: 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. Reed, 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 Microbiology, Microbiology (jointly with the College of Agriculture), 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 leading to the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees.

Departments of Instruction

Environmental Practice

Professors:

Assistant Professors:

5000 Thesis (1-15) P/NP only. E.

5100 Special Topics in Environmental Medicine (1-3) Aspects of aberrant metabolism, pharmacokinetic studies, toxicokinetic studies, epidemiology and techniques in molecular biology: atomic absorption, gas chromatography, ultrascan, mass chromatography, electric techniques and radioimmunoassay. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5200 Experimental Animal Surgery (4) Competence in performing human surgical modifications of experimental animals. Techniques of anesthesia. Drug administration and prooperative care. Prereq: Zoology 4050, 4110, 4080, and/or consent of instructor.
32 Institute of Agriculture/Pathobiology

5611-12 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) P/NP only. 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


5000 Thesis (1-15) P/NP only. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6010 Special Topics in Pathology (1-3)

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.

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, 4439; consent of instructor.

Rural Practice

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

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

5000 Thesis (1-15) P/NP only. E

6000 Doctoral Research and Dissertation (3-15) P/Ph only. E

Urban Practice

Professors: D. J. Krahwinkel, (Acting Head), D.V.M. Auburn.


5000 Thesis (1-15) P/NP only. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

Animal Science/Veterinary Medicine

Professors: D. O. Richardson (Head), Ph.D. Ohio State.


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.

5362 Veterinary Toxicology (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.

5363 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. Roe, Ph.D. Guelph.

Associate Professor: D. A. Brian, D.V.M., Ph.D. Michigan.

For specific course listings please see College of Agriculture, Department of Animal Science, and College of Liberal Arts, Department of Microbiology.
Graduate Programs

The College of Business Administration offers programs leading to six advanced degrees: the Doctor of Business Administration, the Doctor of Philosophy with majors in Economics and in Management Science, the Master of Arts with a major in Economics, the Master of Science with a major in Statistics, the Master of Accountancy, and the Master of Business Administration. The Department of Management and the Department of Psychology in the College of Liberal Arts jointly offer an intercollegiate program in Industrial and Organizational Psychology leading to the Master of Science and Doctor of Philosophy degrees. (See page 94.) Also, the Department of Management Science offers an intercollegiate program leading to the Master of Science degree. (See page 95.) The two College-wide programs, the MBA and the DBA, are described below.

Descriptions of other degree programs will be found under the appropriate departmental or program heading.

Academic Common Market. An agreement among southern states for sharing graduate programs allows legal residents of some states to enroll in certain programs at UTK on an in-state tuition basis. Programs in the College of Business Administration available to residents of the states indicated include: DBA (all concentration areas)—West Virginia; MBA (Transportation and Logistics)—Virginia and West Virginia; Industrial and Organizational Psychology (M.S. and Ph.D.)—Alabama, South Carolina, and Virginia. Additional information may be obtained from the Graduate Programs office of this college.

The MBA Program

The MBA program is designed for students with undergraduate degrees in the social and natural sciences, the humanities, and professional fields such as engineering, business, agriculture, and architecture. A full-time student can complete the program in six academic quarters. Those with degrees in business earned at an institution accredited by the American Assembly of Collegiate Schools of Business (AACSB) should be able to complete the program in five quarters.

Full-time students are expected to successfully complete 12 hours per quarter and part-time students 6 hours per quarter. Scheduling and sequencing of courses are done with this assumption in mind.

The complete MBA program with a concentration in management is offered by the regular graduate faculty of the College for part-time students on the Knoxville campus and at Oak Ridge.

The program consists of the MBA core (twelve to nineteen courses depending upon exemptions based on prior studies and proficiency examinations) and a concentration/electives block of eight courses. 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.
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, Government Financial Administration, Management, 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. Courses numbered below 4000 normally are not approved for the MBA program. Before beginning the concentration/electives part of the curriculum the student must have his/her program approved by the Office of the Graduate Business Dean.

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 (for approximate undergraduate equivalent work) are: Accounting 5010 (6 quarter hours, fundamentals of financial accounting) Business Law 5010 (6 quarter hours, the legal and economic 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, 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 course approved by the Office of the Graduate Business Dean 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 the curriculum policy (page 15) may be credited toward MBA degree requirements within the following limits: MBA Core: 6 hours Concentration Area: 3 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 15) must be approved by two faculty members in the student's area(s) of concentration and the Associate Dean for Graduate Programs in the College of Business Administration, signed by the department head, and submitted to the Graduate Business Dean. 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 quarter for those who have an undergraduate degree in an area other than business and in the fall for students who hold an undergraduate business degree.

There are no admissions for spring or winter quarters. To be considered at 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, academic records, and GMAT score report. The first two items should reach the Graduate School 10 days before the MBA application deadline to allow for internal processing. The MBA application deadline should reach the Office of the Graduate Business Dean by the deadline date.

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

Dual J.D.-MBA Program

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferred dual Doctor of Jurisprudence and 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 anytime prior to, or after, matriculation in either or both colleges. Such approval will be granted, provided that dual program candidates are accepted by both programs at the same time, meet the deadline date.

For admission to the MBA program, the last 28 quarter 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 requirements of both colleges. Students withdrawing from the dual program before completion of both degrees will not receive credit toward graduation from either college for the 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 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 College of Law course 5990-Legal Accounting.

The College of Business Administration will award up to 12 quarter hours of credit toward the MBA degree for acceptable performance...
The DBA Program

The basic objective of the Doctor of Business Administration program is to provide the student with 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 graduate 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 techniques 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, if they desire, earn 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 economic theory (micro and macro). See page 33 for MBA degree requirements. Entering students deficient in any of these areas may enroll in courses designed to meet these requirements.

Course Requirements for the DBA Program. Each student must demonstrate, by passing appropriate graduate level courses and/or by examination, an understanding of the business functional areas, 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. One graduate level course in each of the following areas must be completed: managerial accounting, financial management, marketing management, organization theory and behavior, and business policy. Students who have earned an MBA degree at an accredited institution probably will have met these requirements. Others may include appropriate courses in their programs as approved by their academic committees.

B. Basic Disciplines. Each student must demonstrate proficiency in the following areas by completing course work indicated or by passing appropriate examinations:

Economics: Economics 5110, 5120.

Behavioral Science: Management 5610, 5620.

Quantitative Science: 12 quarter hours in one or a combination of two of the following areas: statistics, management science, econometrics, or computer science. Approval of student's committee is required.

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 24 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 required and 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, additional work in 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 concentration 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 Associate 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 may sit for examinations in both areas at one examining period or take them in two consecutive periods. A student who fails an examination on the first attempt must repeat the examination over that area at the next examining period, the results of which shall be final.

Admission to Candidacy. A student may apply for admission to 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 20.

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 approved by the student's academic committee. "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 Associate Dean for Graduate Programs in the College of Business Administration before submission to the Graduate Office.

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 and the candidate's oral defense of his/her research effort.

Other Requirements. For information concerning program admission requirements, academic standards, fellowships and assistantships, and general rules and regulations of The Graduate School, see other parts of the College of Business Administration section and the first section of the catalog, "The Graduate School." Also see "Academic Common Market," page 13.
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/hers 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 Associate 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 10-11. 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) aptitude portion. 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 10-11), M.Acc., MBA and DBA applicants must submit additional information on forms provided by the College of Business Administration 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 associated with other leading graduate schools of business as a member of the Graduate Management Admission Council.

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. Information on College-administered fellowships is available from the Office of the Graduate Business Dean in the College of Business Administration.

Assistantships. A limited number of teaching assistantships and assistantships that require 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. Assistantships are generally awarded on the basis of scholarship and performance on the admission test. Application forms may be obtained in any of the departments or from the office of the Associate Dean for Graduate Programs. Applications must be received by March 1 for consideration of assistantships and fellowships 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, individual firms, 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 economic, 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 do 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 Department 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 extensive 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 business, critical 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 forty 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

DEGREE

Accounting

M. Acc.

Professors:


Associate Professors:


Assistant Professors:


Distinguished Lecturer:

S. B. Wolfe, B.S. Virginia Polytechnic Institute.

THE MASTER OF ACCOUNTANCY PROGRAM

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

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 coursework. Specifically, the student must
complete courses in selected business disciplines and in the area of accounting as indicated below. Each course is 3 quarter hours of graduate credit.

Business Core (21 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 5101, 5120, 5210, 5420, 5950.
- Accounting Electives (select 12 quarter hours): Accounting 5130, 5140, 5160, 5220, 5430, 5440, 5510, 5640, 5910.

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 examination during the final quarter of study for the degree.
- MBA Concentration: Accounting DBA Concentration: Accounting Minimum Course Requirements for MBA Concentration: Accounting 5110, 5120, 5210, 5420, and two of the following: 5320, 5330, 5340.

All Master of Business Administration student selection policies other than Accounting are required to take a minimum of 6 quarter hours of graduate level accounting in addition to Accounting 5010 or its equivalent. In those instances where Accounting 5020 and/or 5030 would result in substantial duplication of accounting work previously taken, the student shall not be permitted to earn credit in those courses, but must select an equivalent number of graduate accounting hours in lieu thereof. Recommended courses include Accounting 5110, 5120, 5210, 5220, 5420, 5510, and 5640.

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: role of firm and accounting information system. Not available to students with credit for 2110-20 or equivalent. F, Su

5020 Corporate Reporting Problems (3) Analysis of uses and limitations of accounting model of firm. Emphasis on internal and external uses of general purpose financial reports. Prereq: 5010 or equivalent. F, W

5030 Managerial Accounting (3) Analysis of accounting model of firm as vehicle for planning and controlling activities. Attention to development of cost data appropriate to managerial decision models. Prereq: 5020; Economics 5010. W, Sp

5101 Seminar in Accounting Theory (3) Evolution of accounting theory, concepts underlying financial reporting models, and authoritative accounting literature and measurement concepts. Emphasis on periodic performance and financial position. Prereq: Consent of department head. May not be taken by students with credit for 4110-20 or equivalent.

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 Prac- tices (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 current issues in the financial accounting literature. Prereq: 5110.

5160 Graduate Internship in Accounting (3) Full-time resident professional employment for one academic quarter involving quality job experience, written report of responsibilities, and evaluation of student performance. Prereq: Consent of instructor.

5210 Seminar in Advanced Managerial Cost Accounting (3) Advanced analytical and problem-solving techniques in the measurement of cost for purposes of control and decision making. Prereq: 3230 or consent of instructor.

5220 Budgetary Planning and Control Systems (3) Alternative approaches to organizing of planning and control systems to meet management's needs and objectives. Control systems and corporate structure, discretionary expense centers, profit centers, investment centers, transfer 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, nature of evidence, internal control evaluation, and reporting. Not intended for persons who have credit for auditing course. Prereq: 3130. Prereq or coreq: Statistics 4415 or equivalent.

5320 Advanced Auditing (3) Case-oriented, including audit of specific asset, liability, revenue and expense accounts. Emphasis on reporting, data processing, statistical sampling, and internal auditing. Prereq: 4110 with C or better. (Available only to MBA students who do not have credit for 4120.)

5330 Advanced Income Tax (3) Federal income taxation, tax-planning and tax avoidance techniques. Prereq: 3120 with C or higher; 3430 with C or higher. (Available only to MBA students who do not have credit for 4430.)

5340 Consolidations and Business Combin- ations (3) Review of application of accounting for int errelated business entities—domestic and foreign. Not intended for persons who have credit for a course with 5330 or 5340.

5420 Tax Research (3) Development of expertise in tax research utilizing tax service, tax periodicals, legislation, and tax literature. Not intended for persons who have credit for 4440.

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

5440 Taxation of Estates and Gifts (3) Transfers at death, inter vivos transfers, life insurance, annuities and employee death benefits, marital and other de ductions and exemptions, and estate and gift tax returns. Prereq: 4430. (Not available to students with credit for 4440.)

5450 Taxation of Partnerships and Partners (3) Formation, operation, termination, and liquidation and other special problems of partnerships. Prereq: 5420.

5460 Taxation of Corporations and Shareholders (3) Organization and structure, distributions, liquidations, reorganizations and special problems includ ing Subchapter S Corporations and Personal Holding Companies. Prereq: 5420.

5490 Tax Policy (3) Current policies explored through historical development and current status of various types of taxes and American taxing jurisdic- tions: directed research in selected tax functions with areas of textbooks. Prereq: 5430, 5450, 5460.

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

5630 Accounting Systems and EDP Concepts and Control (3) Elements and operation of computer in business environment. Analysis, design, implemen- tation, documentation, and control of accounting systems. Prereq: 2130 and knowledge of a computer programming language.

5640 Seminar in Accounting Information Sys- tems (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 primary issues in practice of accoun tancy. May be repeated. Admission by con sent of department head. S/NC only.

5980 Accounting Research (3) Seminar on current accounting research. May be repeated. Consent of depa rtment head in quarter prior to anticipated enrollment.

6000 Doctoral Research and Dissertation (3-15) P/PN only. E

6110-20-30 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.

6200 Legal and Social Environment of Business (3) Legal environment of business, with emphasis on legal concepts and principles that pertain to business management. Not available to students with credit for 4110-20 or equivalent. F, W, Su

6310 Administrative Regulation of Business (3) Federal Register System and Administrative Proce- dure Act and their relationship to business. How a regulation is made and enforced. Other legal con trols of administrative agencies. Not available to stu dents with credit for 4110-20 or equivalent. Prereq: 4120 or 5010 or consent of instructor.

Business Administration

MAJOR

Business Administration DEGREES

MA, DBA

5310 Business Policy (3) Case studies covering policy formulation and implementation, point of depart-ure—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 and measurable goals and utilizing personnel to reach company objectives, continuously administra- tive reappraisals. Enrollment priority given MBA students in last quarter of their program. Prereq: All MBA 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 Applied Business Analysis (3) Application of business concepts and analytical skills to problems of small businesses in community. Students selected by consent 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., Ph.D.

Professors:

P. D. Quarles (Head), Ph.D. California (Berkeley); R. A. Bohm, Ph.D. Washington (St. Louis); R. L. Bowby, Ph.D. Texas; S. L. Carroll, Ph.D. Harvard; W. C. Cole, Ph.D. Texas; G. F. Feiwel*, Ph.D. Wake; H. S. Hare, Ph.D. Berkeley; B. Gunther, Ph.D. Kentucky; J. F. Holly (Emeritus), Ph.D. Clark; H. E. Jensen, Ph.D. Minnesota; T. F. V. Lee, Ph.D. Michigan State; A. Mayhew, Ph.D. Texas; J. R. Moore, Ph.D. Rochester; J. F. Powell, Ph.D. Arizona; G. A. Spiva, Ph.D. Texas.

Associate Professors:

H. S. Chang, Ph. D. Vanderbilt; W. F. Fox, Ph. D. Ohio State; E. Glustoff, Ph. D. Stanford; H. W. Herzog, Ph.D. Maryland; D. L. Kaserman, Ph.D. Florida; K. E. Phillips, Ph.D. Washington (Seattle); A. M. Schottman, Ph.D. Washington (St. Louis).

Assistant Professors:

D. P. Clark, Ph.D. Michigan State; R. A. Hofer, Ph.D. North Carolina; J. W. Mayo, Ph.D. Washington (St. Louis); N. C. Modeste, Ph.D. Florida; K. L. Murphy, Ph.D. Michigan State; H. Thompson, Ph.D. Houston; E. D. Wickham (part-time), Ph.D. Rochester.

THE MASTER'S PROGRAM

The minimum requirements for a graduate major in Economics for the Master of Arts degree consist of the following: (1) Economics 5111-12 and 5121-22, (2) 9 additional hours in economics at the 4000 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 the consent of the head of the economics department, an alternative sequence of 9 hours to meet unusual conditions.

THE DOCTORAL PROGRAM

Subject Area Requirements

1. Students will be required to complete the requirements in core subject fields as indicated:

- 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 5113-14.
- Economic history: 8 hours of economic history at the 5000 level or above.
- History of economics: Economics 5150 and 3 hours at the 6000 level.

2. Mathematical and quantitative methods: Economics 5180, 5190, and 5510. The 5510 requirement may be waived for students completing Economics 6170, 6180 and 6190. Students must achieve a grade average of B or higher for all courses offered to fulfill requirements. b, c, and d, or as an alternative, may petition to satisfy any one or all of these three fields by some other means such as comprehensive examination.

- 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; economics of 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 tenured 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) P/NP only E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis degree only. Transferable to other program during any quarter when such a student uses university and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5011-12 Problems in Lieu of Thesis (3, 3) S/NC only.

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/NC only. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

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: 3110 or equivalent. F

4120 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: 3100 or consent of instructor.

4150 History of Economic Thought (3) Development of economic ideas as a social science, together with an analysis of socioeconomic conditions which influenced the development. Prereq: 2110 through 1936. Prereq: 1 yr of principles of economics and consent of instructor. F

4170-80 Introduction to Mathematical Economics (3) Application of points, lines, planes, and geometric structures to 27 models of economic 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 the 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, banking system. Not available to students with credit for 2110-20-30 or equivalent. F, 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 5202 or equivalent. F, W

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

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

5111-12 Microeconomic Theory I, II (3, 3) Theory of consumer choices; demand; theory of the firm; theory of production and costs; market structures; derived demand and 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 and income; determination of liquidity preference. For students whose major is other than economics. Not available for students with credit for 5121. Prereq: 5110 or equivalent. F, W

5121-22 Macroeconomic Theory I, II (3, 3) Money 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.

5190-90 Mathematical Methods in Economics (3, 3) Applications of basic concepts in differential and integral calculus, determinants and matrix algebra, and differential equations, linear algebra and stochastic models to topics in theory of firm, growth models, game theory, linear programming, and economic growth under uncertainty. Prereq: 1 yr of calculus. Sp, F

5510 Quantitative Methods in Economic Research (2) Methods of estimation and testing of economic relationships with use of time series and cross section data with applications to economic problems. Prereq: Introductory statistics or Statistics 5211 or equivalent. W

5520 Introduction to Econometrics (3) Statistical tools of analysis, production and cost analysis, distribution of income and wealth, models of growth and
cycles. macroeconomic applications. Should not be taken by students who contemplate taking Econo-

6101 Advanced Microeconomic Theory (3) Concepts and techniques of microeconomic theory, including theory of the firm, consumer behavior, price theory, and general equilibrium. Prereq: 5010 or equivalent. F.

6102 Advanced Microeconomic Theory (3) Topics in microeconomic theory and policy. Prereq: 5122 or equivalent. W.

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


ECONOMICS OF CENTRALLY PLANNED ECONOMIES

5310 Economic Systems (3) Study and appraisal of underlying theories and operation of capitalism, socialism, communism, and other economic systems. W.

5331 Theory and Practice of Economic Planning (3) Leading issues in imperative and indicative planning. Prereq: Consent of instructor. May be repeated with consent of department. F.

ECONOMICS OF LABOR AND HUMAN RESOURCES

4420 Economics of Human Resources (3) Analysis of current problems in human resource development and examination of policies aimed at their solution. Prereq: 5110 or equivalent. W.

5440 Labor Relations Law (3, 3) Legal background and effects of governmental regulation of labor relations; detailed examination of National Labor Relations Act as amended. Prereq: 3440. W.


5450 Seminar in Industrial Relations (4) Historical development of American system of industrial relations and roots of contemporary labor problems. Nature of labor union and collective bargaining process. Resolution of industrial conflict. Prereq: 5 hrs of labor relations or consent of instructor.

5460 Seminar in Labor Economics (4) Theory of labor markets and human capital. Analysis of wage determination and the determination of unemployment, wage differentials, economic discrimination, and impact of unionism. Prereq: 3110 and 3120, or equivalent.

5470 Public Policy in the Labor Field (4) Governmental regulation of wages, hours, and other aspects of industrial relations. Public policy in areas of labor relations, employment, and unemployment. Employment opportunities, occupational health and safety, social insurance, and immigration policy. Prereq: 5450 and 5460.

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 economic and economic development. Prereq: 3210 or 3220. W.

4231 The Political Economy of Latin America (3) Description, analysis, and comparison of major economic problems and policies of various Latin American countries. Prereq: Consent of instructor. May be repeated with consent of department. W.

4232 The Political Economy of Asian Development (3) Description, analysis, and comparison of major economics problems and policies of India, China, and Southeast Asian countries. Prereq: Consent of instructor. May be repeated with consent of department. W.

5250 Economics of Resources and Environmental Policy (3) Economic analysis of environmental policy and allocation of resources. Benefits and costs of development of natural resources and impacts of growth on environment. Prereq: 2130. W.

5256 Economic History of Europe (3) Nature and functioning of economic systems and policies in history of western civilization; examination of some major issues of method and interpretation. F.

5256 Economic History of the U.S. (3) Interpretation of American economic structure and policies from colonial times. W.

5610 Location and Regional Development Theory (3) Theory of industrial, agricultural, and residential location; location of real estate; theory of central places; examination of regional inequalities and national assistance for regional economic development. Prereq: 5120 or equivalent. F.

5620 Methods of Regional Analysis (3) Theory of regional structure and growth. Examination of regional models for impact analysis and economic forecasting. Methods of analysis include regional descriptive statistics, gravity and potential concepts, regional income and product accounts, shift and share analysis, economic base studies, and regional input-output, linear programming, and econometric models. W.

5621 International Economics: Trade (4) Pure theory of classical, neoclassical, and modern international trade. Comparative advantage, free trade and welfare, and technological change, growth and migration, tariffs and subsidies, and customs unions. Prereq: 5112 or consent of instructor.


5623 International Monetary Economics (4) Theories of exchange rate determination, and approaches to balance of payments theory, balance of payments adjustment under alternative exchange rate regimes, economic policy in open economy, international capital movements. Prereq: 5121, 5030, 5120 or consent of instructor.

231 Economic Development: Theories (4) Study of principal theories explaining economic behavior in less developed countries. Prereq: 21 hrs of undergraduate economics or consent of instructor.

232 Economic Development: Policies (4) Policies, strategies, and planning techniques used to promote modernization and economic development in less developed countries. Prereq: 6231 or consent of instructor.

2421 Economic Development: Western Impact on Asia and Africa (4) Studies of consequences of contact between developed world and third world countries of Africa and Asia. Prereq: 21 hrs of upper division undergraduate social science or consent of instructor.

242 Seminar in Economic Development (4) Topics vary with interests of students. Prereq: 6241 or consent of instructor.

250 Seminar in European Economic History (3) Selected topics in European economic history. Prereq: Consent of instructor. May be repeated with consent of department. W.
Assistant Professors: T. P. Boehm, Ph.D. Washington (St. Louis); D. Choi, Ph.D. Pennsylvania State, W. P. Lau, Ph.D. Wisconsin; H. A. Weir, Ph.D. North Carolina.

MBA Concentrations: Finance; Governmental Financial Administration; Real Estate and Urban Development.

DBA Concentration: Finance

Minimum Course Requirements for MBA Concentrations: Finance—For the Financial Management Concentration 5110, 5130, 5140; for the Investments area: 5420, 5430, 5440; for the Banking and Financial Institutions area: 5810, 5820, 5830.

Governmental Financial Administration—5710, 5720, 5730, 5740. Real Estate and Urban Development—Real Estate 5110, 5120, 5130, 5140.

5002 Non-Thesis Graduate 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

5910-20-30 Finance Seminar (1, 1, 1) Research and Development systems. Management concepts and quantitative techniques in formulation and solution of financial management problems. W


5990 Research in Finance (3) Directed research on topical research projects. Prereq: 5020. May be repeated. Maximum 6 hrs.

6410-20 Seminar in Theory of Finance (3, 3) Theory of financial decision making under conditions of certainty and uncertainty. Application of economic theory of choice to allocation of resources over time and under uncertainty with reference to investment and financing decisions. F, W

6510 Seminar in Financial Management (3) Employment of quantitative techniques in formulation and solution of financial management problems. W

5820 Capital Formation and Capital Intermediaries (3) Capital formation and allocation of capital in U.S. problems and abroad. Process of saving, partial institutionalization of these savings, investments of financial intermediaries, efficiency of allocation process and effect on economy, and impact of financial institutions on financial markets. (Same as Economics 5810.) W

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

5810 Financial Institutions and Markets (3) Theory of financial markets, role of financial institutions, and analysis of market efficiency.

INSURANCE

5110 Theory of Risk Management (3) (For students with no background in 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

5110 Urban Economic Analysis (3) Urban economics. Land value and use. Analysis of current urban problems in United States. Prereq: Economics 5010 or consent of instructor. F

5120 Real Estate Analysis (3) Analysis of real property investment, real estate finance and appraisal theory. Prereq: Finance 5010 or Planning 5465 or consent of instructor. F

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

5140 Real Estate Investment and Taxation Analysis (3) Analysis of economic factors and institutions which underlie real estate investment decision making. Case method utilized. Prereq: 5120 or consent of instructor. Sp

Management


Associate Professors: F. A. Chambin, Emeritus, M.B.A. Indiana; C. S. Fowler, Ph.D. Pennsylvania; R. C. Matios, Ph.D. Texas; W. Neel, Ph.D. Alabama; M. C. Rush, Ph.D. Akron.


5910-20-30 Finance Seminar (1, 1, 1) Research and Development systems. Management concepts and quantitative techniques in formulation and solution of financial management problems. W


5990 Research in Finance (3) Directed research on topical research projects. Prereq: 5020. May be repeated. Maximum 6 hrs.

6410-20 Seminar in Theory of Finance (3, 3) Theory of financial decision making under conditions of certainty and uncertainty. Application of economic theory of choice to allocation of resources over time and under uncertainty with reference to investment and financing decisions. F, W

6510 Seminar in Financial Management (3) Employment of quantitative techniques in formulation and solution of financial management problems. W

5820 Capital Formation and Capital Intermediaries (3) Capital formation and allocation of capital in U.S. problems and abroad. Process of saving, partial institutionalization of these savings, investments of financial intermediaries, efficiency of allocation process and effect on economy, and impact of financial institutions on financial markets. (Same as Economics 5810.) W

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

5810 Financial Institutions and Markets (3) Theory of financial markets, role of financial institutions, and analysis of market efficiency.

INSURANCE

5110 Theory of Risk Management (3) (For students with no background in 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

5110 Urban Economic Analysis (3) Urban economics. Land value and use. Analysis of current urban problems in United States. Prereq: Economics 5010 or consent of instructor. F

5120 Real Estate Analysis (3) Analysis of real property investment, real estate finance and appraisal theory. Prereq: Finance 5010 or Planning 5465 or consent of instructor. F

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

5140 Real Estate Investment and Taxation Analysis (3) Analysis of economic factors and institutions which underlie real estate investment decision making. Case method utilized. Prereq: 5120 or consent of instructor. Sp

Management


Associate Professors: F. A. Chambin, Emeritus, M.B.A. Indiana; C. S. Fowler, Ph.D. Pennsylvania; R. C. Matios, Ph.D. Texas; W. Neel, Ph.D. Alabama; M. C. Rush, Ph.D. Akron.
research proposals. Prereq: DBA student status or consent of instructor. S/NC only. Sp

5810 Energy Management: Theory and Practice (3) Management of energy issues in operating systems; decision criteria, trade-offs, system analysis, energy audits, technical parameters, conservation programs, environmental energy supply and demand, new energy technologies.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110 History of Management Thought (3) Significant 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 management, innovative development, group process, and morale. (Same as Psychology 6250-60-70.)

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

6900 Field Work in Industrial and Organizational Psychology (1-18) Supervised practice. One credit for each 30 hrs of such practice. Maximum 15 credits. (Same as Psychology 6900.) E

Manpower Science

MAJOR

Management Science

DEGREE

Ph.D.

Professor:

R. S. Garlinkel (Chairperson), Ph.D. Johns Hopkins.

Associate Professors:

J. K. Ho, Ph.D. Stanford; R. E. Roseinthal, Ph.D. Georgia Institute of Technology.

Management Science Committee:

Members of the Management Science faculty and in addition: R. W. Boling, Management; J. S. Bradley, Management; E. Gluostic Economics; W. J. Morre, Accounting; R. E. Shrieve, Finance; C. C. Thigpen, Statistical Science; D. C. Estes, Computer Science; K. C. Gilbert, Management.

MBA CONCENTRATIONS

For students whose MBA concentration area is Management Science, the MBA Core is revised as follows: substitute Management Science 5310 for 5010, and with approval of student’s advisor, substitute Statistics 5120 for 5020. The concentration area must include Management Science 5330 and 5340.

MARTOR OF SCIENCE PROGRAM

See page 95 for details of the Master of Science program in Management Science.

THE DOCTORAL PROGRAM

The Ph.D. program in Management Science is designed to prepare students for management positions, research, and teaching related to the application of mathematical tools in the administration of complex organizations. Three primary objectives of the program are:

1. To provide advanced management science coursework, a thorough knowledge of common Management Science/Operations Research mathematical models and their uses;

2. To provide sufficient advanced study in a supporting area to qualify the graduate for a joint faculty position in the supporting area and management science. The candidate may choose from the business functional areas (accounting, finance, marketing, production management, and transportation and logistics) or other disciplines, (e.g., computer science, statistics, forestry, ecology, and public administration);

3. To develop in the student, through course work in mathematics, statistics, and computer science, a high degree of mathematical maturity which will serve the graduate well throughout a life-long career, whether in management, research, or teaching.

Degree Requirements: Departmental diversity requirements for the doctoral degree are stated on page 19.

Course work. A minimum of 72 quarter hours of course work taken for graduate credit (exclusive of thesis or dissertation) is required. The candidate must complete a minimum of 36 quarter hours at The University of Tennessee, Knoxville, at least 9 of which must be at the 6000 level. Entering students who have completed graduate work in applicable fields will be granted course credit for work which is equivalent to required courses in the program.

The program consists of approximately 24 to 30 quarter hours of course work in the applied concentration area.

Qualifying Examinations. The student must demonstrate mastery of probability theory and mathematical statistics (Statistics 5110-20-30) by passing a written qualifying examination. Mastery of 18 to 21 quarter hours in mathematics coursework may be demonstrated by passing a written qualifying examination. Other options may be approved. In exceptional circumstances the faculty will consider waiving the mathematics and/or statistics qualifying examinations.

There is no foreign language requirement.

The qualifying examinations in each student's program are completed by the end of the first year of the program.

Comprehensive Examination. Prior to admission to candidacy for the degree, and normally after completion of the second year of the program, the student must pass a written comprehensive examination covering the theory of deterministic and stochastic management science models. Topics included in this examination are determined on an individual basis. Students will be expected to demonstrate an integrative ability that goes beyond simple mastery of course content.

Research and Dissertation. The student must complete at least 30 quarter hours of Management Science 6000, Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the field of management science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 72 quarter hours of course work, normally is completed in the third year of the program.

Prerequisites for Management Science Courses. The Management Science Program is interdisciplinary and students in other degree programs are encouraged to enroll in management science courses. Course prerequisites are designed to indicate the level at which courses are taught. Interested students whose prior course work does not match the prerequisites are encouraged to seek the instructor’s guidance and consent to enroll.

5000 Thesis (1-15) P/NP only. E

5022 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 5310-20-30 to large scale management science 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 (1-4) Directed study on subject of mutual interest to student and staff member. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110-20-30 Models for Production Systems (3, 3, 3) Seminar providing research practice to enhance professional development. Course work includes investigation of existing mathematical models for production processes and opportunities for original research.

6210-20 Network Flows (3, 3) In-depth treatment of widely applied network optimization algorithms including transportation and transshipment; primal-dual linear programming methods; and group theoretic algorithms. Prereq: 5310 or equivalent.

6310 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group theoretic algorithms. Prereq: 5310 or equivalent.

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

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.


5335 Mathematical Programming Computational Systems (2) Practical aspects of using state-of-the-art mathematical programming systems. Students will write complete management science code and report writing software for specific applications. Sp.

5340 Application of Management Science Methods (3) Application of methods from 5310-20-30 to large scale management science 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 (1-4) Directed study on subject of mutual interest to student and staff member. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110-20-30 Models for Production Systems (3, 3, 3) Seminar providing research practice to enhance professional development. Course work includes investigation of existing mathematical models for production processes and opportunities for original research.

6210-20 Network Flows (3, 3) In-depth treatment of widely applied network optimization algorithms including transportation and transshipment; primal-dual linear programming methods; and group theoretic algorithms. Prereq: 5310 or equivalent.

6310 Integer Programming (3) Theoretical and computational aspects of linear programming with integer variables, branch and bound, cutting plane, and group theoretic algorithms. Prereq: 5310 or equivalent.

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

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.


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

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

5400 Analyzing Market Opportunity for Marketing Decisions (3) Basic determinants of opportunity within marketing environment for identifying and organizing opportunities required to assess market opportunity. Approaches to analyzing buyers in markets, forecasting demand, analyzing industry/channel/competitor service. Emphasis on applying market opportunity analysis results to marketing decisions. 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. Political, cultural, and economic conditions in different countries. Prereq: 5200. W

5950 Research in Marketing (3) Directed research on subjects of mutual interest to student and staff member. Prereq: 5200 and 5300. May be repeated. Maximum 6 hrs.

6000 Doctoral Research and Dissertation (1-15) Prereq: Consent of instructor. A

6050 Macro/Theoretical Foundations of Marketing (3) Fundamental nature and history of marketing processes. Role of marketing theory in developing marketing policy and research process. Environmental/public policy dimensions of marketing decision making. Prereq: Consent of instructor. A

6100 Design and Measurement in Marketing Research (3) Advanced design and measurement issues. Theoretical scaling considerations, applications of multidimensional scaling techniques, and conjoint analysis. Prereq: Consent of instructor. A

6150 Marketing Research Applications (3) Application of multivariate research tools to functional areas of marketing. Prereq: Knowledge of multivariate analysis and consent of instructor. A

6200 Buyer Behavior (3) Behavioral processes of individuals and groups in roles as buyers of goods and services. Prereq: Consent of instructor. A

6250 Selected Problems in Consumer Behavior (3) Information search processes, attitude models, attitude theory, and consumer satisfaction. Prereq: Consent of instructor. A

6300 Marketing Decision Models (3) Model building processes in the development of marketing policies and strategies. Bayesian analysis, simulation models, brand switching models, stochastic models, dynamic models, and mathematical models. Prereq: Consent of instructor. A

6350 Current Topics in Marketing (3) Specific topics will vary with each course offering, but could include: nonbusiness marketing applications, macroenvironmental issues, market segmentation, children's television advertising, international marketing issues, marketing channels, and related issues. Prereq: Consent of instructor.

Transportation and Logistics


Associate Professors: E. R. Cadotte, Ph.D. Ohio State; R. L. Jenkins, Ph.D. Ohio State; R. C. Reizenstein, Ph.D. Cornell; G. D. Senter, DBA Indiana; R. L. Spino, Ph.D. Georgia

Assistant Professor: L. R. Duffus, Ph.D. Purdue

MBA 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

5010 Marketing and Distribution Management (3) Concepts, methods, and techniques. Prerequisite to all other DBA Concentration courses. May be repeated. S/NC only. E

5020 Marketing Strategy and Decision Making (3) Management of basic marketing functions. Integration of functional decisional areas into development of marketing strategy, both domestic and international. Prereq: 5010. Prereq or coreq: Economics 5020; Statistics 5010. F, W, Sp

5050 Managerial Applications of Multivariable Statistics (3) Directed study in surface and air transportation. Analysis of U.S. policy relative to international transportation. Prereq: Consent of instructor. A

5090 Research in Transportation (3) Directed research on subjects of mutual interest to student and staff member. Prereq: 5020 and 5300. May be repeated. Maximum 6 hrs.

6000 Doctoral Research and Dissertation (1-15) Prereq: Consent of instructor. A

6050 Macro/Theoretical Foundations of Transportation (3) Fundamental nature and history of transportation processes. Role of transportation theory in developing transportation policy and research process. Environmental/public policy dimensions of transportation decision making. Prereq: Consent of instructor. A

6100 Design and Measurement in Transportation Research (3) Advanced design and measurement issues. Theoretical scaling considerations, applications of multidimensional scaling techniques, and conjoint analysis. Prereq: Consent of instructor. A

6150 Transportation Research Applications (3) Application of multivariate research tools to functional areas of transportation. Prereq: Knowledge of multivariate analysis and consent of instructor. A

6200 Buyer Behavior (3) Behavioral processes of individuals and groups in roles as buyers of goods and services. Prereq: Consent of instructor. A

6250 Selected Problems in Consumer Behavior (3) Information search processes, attitude models, attitude theory, and consumer satisfaction. Prereq: Consent of instructor. A

6300 Transportation Decision Models (3) Model building processes in the development of transportation policies and strategies. Bayesian analysis, simulation models, brand switching models, stochastic models, dynamic models, and mathematical models. Prereq: Consent of instructor. A

6350 Current Topics in Transportation (3) Specific topics will vary with each course offering, but could include: nonbusiness transportation applications, macroenvironmental issues, market segmentation, children's television advertising, international transportation issues, marketing channels, and related issues. Prereq: Consent of instructor.

Transportation and Logistics


Associate Professors: E. R. Cadotte, Ph.D. Ohio State; J. H. Fogglin, DBA Indiana

MBA Concentration: Transportation and Logistics

Minimum Course Requirements for MBA Concentration: 18 credit hours required including 5010, 5200, 5350. Transportation 5010 is prerequisite to all other graduate courses in this area.

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 Survey of Transportation and Logistics (3) Intensive survey of logistical demands made by society and specific users on nation's transportation system; problems facing carriers and government. Sp


5120 Management and the Pricing Problem (3) Critical analysis of application of economic theory and regulatory constraints to pricing of carrier services. Sp

5130 Carrier Transportation Management (3) Analysis of major transportation modes and their managerial strategies. Consideration of how social, technical, legal, and financial environment affects top level decision making. Application of general business, marketing, finance, and statistical decision processes to transportation decision making in uncertain environment. F

5220 Logistics Systems Management (3) Development of strategy for logistical decision making in multiple environments. Emphasis on executive level integration of logistics operations with marketing, production, and other decision areas. Practical applications through a case approach and simulation game. Prereq: Management 5020. W

5510 Urban Transportation Policy (3) Movement of people, goods, and information in urbanized areas with special emphasis on formulation of national, state and local policy. Emphasis on evolving new urban transportation concepts. W

5810 International Transportation Policy (3) Comparative analysis of transport systems in other countries. Analysis of U.S. policy relative to international transportation. Sp

5910 Advanced Law and Regulation (3) Legal rights and responsibilities of shippers and carriers. Analysis of decisions of regulatory commissions, courts, and principles of law arising from these decisions. Sp

5990 Independent Study in Transportation/Logistics (3) Directed study in surface and air transportation, national transportation policy, transportation/logistics research developments, or subject of particular interest to student and faculty. May be repeated. Maximum 6 hrs. E

6000 Doctoral Research and Dissertation (1-15) P/NP only. E

6110 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 economic impact on topic basis at discretion of instructor. Prereq: Management Science 5010; Statistics 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. W. Wagner (Emeritus), M.S., Indiana.

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

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

Assistant Professors: P. G. 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 memos; principles applied by solving communication cases; emphasis placed on letters and memos as initial sources of ideas in communications system of the business firm. E

4320 Business Report Writing (3) Basic principles and procedures of originating and disseminating 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. E

4420 Advanced Transcription (3) Improvement of ability to transcribe mailable 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; recruiting, selection, training, and development of office staff; directing of office staff through leadership, motivation, communications; measurement of office performance, comparison to standards, and corrective actions; and applications of decision making to the office. Sp

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. Sp

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

5011 Problems in Lieu of Thesis (3) S/NC only.

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

Statistics

DEGREE

M.S.

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

Associate Professor: 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: G. B. Ranney, Ph.D., North Carolina State; S. W. Ward, Ph.D., Virginia Polytechnic Institute.

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
- Theory of statistical inference
- Additional coursework in statistics as approved by the student’s committee
- Minor Area
- Selected with the approval of both the Department of Statistics and the department in which the work is to be taken
- Thesis
- Total minimum hours

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 5120 and 5130. Normally, Statistics 5250-60-70 are also included which require 3450 as a prerequisite. Statistics courses numbered 4000 and above presuppose 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 5110. Prereq: 2610. E

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. Sp

4310 Regression Analysis (3) Linear regression and correlation, multiple regression, stepwise methods, polynomial regression, use of dummy variables. Use of standard regression computer programs. Elements of theory and application. F, Su

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 5410. F, W, Sp

5000 Thesis (1-15) F/P/N only. 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

*Twelve hours of approved course work, to include Statistics 5610, may be substituted for the thesis requirement.

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: 5101. W, Sp

5050-60-70 Statistical Analysis for the Behavioral Sciences (3, 3, 3) 5050—Probability distributions, sampling distributions, estimation and hypothesis testing. Parametric and nonparametric procedures. Prereq: 1 yr college mathematics and one course in statistics. 5060—Linear and multiple correlation methods, correlation for ranked and grouped data. Continuation of 5050. 5070—Analysis of variance and covariance; design of experiments. Parametric and nonparametric procedures. A continuation of 5050. F; 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


5510 Special Topics in Statistics (3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6060 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: 6060. Sp

6210 Stochastic Processes II (3) Special analysis, time series, linear and nonlinear systems. Prereq: 5210.
College of Communications

Donald G. Hileman, Dean
Paul G. Ashdown, Assistant Dean for Undergraduate Studies
Herbert H. Howard, Assistant Dean for Graduate Studies and Research

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.

MASTERS 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 only 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.)

Applicants 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, core courses begin only in the fall quarter. 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 6140, 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), including 3 hours of thesis seminar.

The professional track is designed for the student who 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); including at least 3 hours of thesis seminar;
-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 a wide variety of career goals in communications. New students may be admitted to the program at any time; however, core courses begin only in the fall quarter.
The Master’s degree is not required for entry into or completion of the doctoral program. Program planning, however, will permit the Master’s degree to be earned if desired. Students lacking academic or professional experience in communications will be required to take prerequisite courses. In general, however, the program may be completed within three academic years of full-time study beyond the Bachelor’s degree. Those holding Master’s degrees should anticipate two or more years of full-time study for completion of the Ph.D. 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 fiftieth 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 doctoral degree; (f) approval of the 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 course requirements for the Ph.D. are:

1. Core 57 hrs
   Communications 5120, 5121, 5140, 5200, 5410, 5420, 5470, 6100, 6140, 6141, 6200; one of the following: 6300, 6310, 6320, 6330, plus 6 additional hours of advanced research courses; Statistics 5050 and 5060; 6 graduate hours of education; 3 graduate hours of organizational behavior; Computer Science 4210.

2. Primary Concentration 21 hrs
   (Advertising, broadcasting, journalism, public relations, or speech communication)

3. Secondary Concentration 18 hrs
   (Outside the College of Communications or a second concentration in Communications)

4. Dissertation 36 hrs

Total 132 hrs

Admission to candidacy must be obtained at least three quarters prior to graduation and requires successful completion of a comprehensive examination. A diagnostic exam also must be taken about two quarters after entering the doctoral program. This exam covers Communications 6100, 5120-21, 5140, 6100, 6140, and one statistics course.

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 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.

**Departments of Instruction**

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

**Communications**

**MAJOR DEGREES**

Communications M.A., Ph.D.


5000 Thesis (1-15) P/NP only. E

5000 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 style, thesis and degree requirements and procedure, overview of traditional and behavioral research methods. Su, F

5120 Communications Research Design (3) Non-experimental, quasi-experimental, laboratory and field experimental designs. Universal research process from idea/problem definition to reporting results. Correlation vs. causation. Su, F

5121 Communications Research Methods (3) Fundamentals and specific applications of most common data-gathering and measurement techniques in communications research: focus groups, mail, personal and telephone surveys; content analysis: mechanical and physiological measurement: observation: attitude measurement. Prereq: 5120, W

5130 Advanced Principles of Mass Communications (3) Preseminar covering all phases of mass communications including history, development and current uses of communication industry, principles of broadcasting, and principles of advertising. F

5140 Mass Communication Theory I (3) Critical appraisal of selected hypotheses and theoretical concepts in research literature of mass communication.
Advertising

Professors: J. A. Crook (Director), Ph.D.; Iowa State; J. B. Heskens, Ph.D.; Minnesota; B. K. Lipert, Ph.D.; Southern Illinois; D. N. Ninmo, Ph.D.; Vanderbilt

Associate Professors: J. N. Matheson, M.S.; Tennessee; G. A. Freshwater, Ph.D.; Bowling Green; G. A. Everitt, Ph.D.; Iowa; M. M. Miller, Ph.D.; Michigan State; J. M. Singletary, Ph.D.; Southern Illinois; F. B. Thornburg, M.A.; Florida

Assistant Professors: M. L. Kerr, Ph.D.; Wisconsin; D. L. Smith, M.A.; San Francisco State.

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.

3140 Communications Law (3) Statutory law and judicial precedents affecting mass communications media. Libel, contempt of court, invasion of privacy, copyright. Broadcasting, advertising and postal regulations.

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

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

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

3990 Journalism Research Methods (3) Use of social science research methods in journalism with emphasis on survey techniques, interpretation and communication of research findings to public. W, Sp.

4130 Editorial Writing (3) Analysis of editorial policies, practices, pages. Writing of editorials and columns, with emphasis on study and use of rhetorical devices and logic.

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


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


4560 Investigative Reporting (3) Investigative and interpretive reporting of complex or specialized subjects to place news in perspective or to clarify situations. Emphasis on writing for publication. Prereq: 2230. W.

4710 Public Relations Cases (3) Case studies and applications of public relations principles to problems in business and industry, government, institutions, trades and professions, solving problems in public relations situations. Prereq: 3730. F, Sp.

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

4910 News and Feature Photography (3) Advanced principles and methods in black-and-white photography. Emphasis on news and feature photography and picture stories. Prereq: 3910 or consent of instructor.

4950 International Communications (3) Communication of news and opinion among nations and peoples.
under varying types of political and economic systems; world news organizations; the press as a factor 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, judicial, legislative, and regulatory segments of governmental and press. Prereq: 3110 or consent of instructor. W

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

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

5560 Magazine Article Writing (3) Techniques of writing in-depth articles for mass circulation magazines. 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 Communications (3) Problems of communication between institutions and organizations and their publics. Case histories and evaluations of programs. Prereq: 3710 or consent of instructor.

5810 Magazine Editing and Production (3) Analysis of editorial and production problems of general, regional, and specialized publications. Reader interest 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)
College of Education

William H. Coffield, Dean
C. Glennon Rowell, Associate Dean for Instructional Programs
Thomas W. George, Assistant Dean for Support Services
Madge M. Phillips, Director, School of Health, Physical Education, and Recreation
Charles M. Peccolo, Director, Bureau of Educational Research and Service

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

DOCTORAL DEGREES

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 21 Hours
Foreign or Computer Language (demonstrate proficiency) 0-9 Hours
General Core Requirements
Courses in history of education, philosophy of education
(two areas must be represented) 6 Hours Minimum
Courses in learning theory, curriculum theory, and administrative theory (three areas must be represented) 9 Hours Minimum
Trans-college seminar—four consecutive quarters 4 Hours Minimum
Specialization:
Major Option—A minimum of 24 hours normally selected from one or two emphases within the major option 24 Hours Minimum
Supporting Emphasis—A minimum of 12 hours selected from an emphasis other than those emphasized selected in the major option. (May be selected from any one of the five options but not a combination of options.) 12 Hours Minimum
Cognate—A minimum of 9 hours selected from outside the College in addition to the designated research courses. 9 Hours Minimum
Dissertation 36 Hours Minimum

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: i.e., 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
Cognitive and Motor Learning
Career Development
Consultation for the Helping Professions
Counseling Psychology
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 changes 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 Professors:

Assistant Professor:
J. P. Watkins, M.S. Tennessee.

The Master of Science degree in Art Education is offered for art teachers, supervisors, and art-trained persons 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. Curriculum and Instruction 5710, and electives ................................ 9
3. Minor (selected with committee) ......................................................... 9
4. Thesis (Art Education 5000) ............................................................... 9

The non-thesis option requires 45 quarter hours as follows:

**Quarter hours**

1. Art Education 5210, 5310, 5320, and electives ................................. 21
2. Curriculum and Instruction 5800, and electives ................................. 9
3. Minor (selected with committee) ......................................................... 9
4. Electives ................................................................................................ 6

The 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.

4350-60-70 Problems in Art Teaching (3, 3, 3) Preq: Consent of Instructor. E
5000 Thesis (1-15) P/NP only. 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
5210 Organization, Administration, and Supervision of Art in the School Program (3) W
5310 Art in Education (3) Historical background, current philosophy, theory, and trends; nature and function of aesthetic behavior in visual arts; relationships to psychology, sociology, and anthropology. F
5320 Program Development in Art Education (3) Prereq: Consent of instructor. F, W, Sp
5680-60-70 Problems in Art Education (3, 3, 3) Preq: 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

<table>
<thead>
<tr>
<th>Quarter hours</th>
</tr>
</thead>
</table>
| Music Education 5210, 5220, 5230 and electives ........................................ 18
| Music electives ................................................................. 9
| Professional education courses including Curriculum and Instruction 5710 .................. 9
| Music Education 5000 ............................................................... 9

Total 45

Requirements for non-thesis option: 51

<table>
<thead>
<tr>
<th>Quarter hours</th>
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</thead>
</table>
| 1. Course requirements (a) Music Education 5210, 5240, 5250, 5710, one seminar, and electives numbered 5000 and above .... 27
| (b) Music electives at 3000, 4000, and 5000 levels (not to include required undergraduate curricula courses) .................... 15
| (c) Professional education electives including Curriculum and Instruction 5610, Educational Counseling and Psychology 4760, and Educational Counseling and Psychology 5050, 5320, or other appropriate course .......... 9

Total 51

2. 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(1) accepted by the committee as music suitable for school music performing groups.

(4) Plan, rehearse and conduct a full 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.

3. 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
4450 Music In Special Education (3) Techniques and materials for exceptional children. Prereq: 3110-20.
4460 Marching Band Techniques (3) Functions, organization, and direction of a school marching band. Prereq: Consent of instructor. Coreq: 3511. F, Su
5000 Thesis (1-15) P/NP only. 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 Studies in Secondary School Music (3) Development of understandings regarding growth patterns and processes through music experiences; cultural and community influences on secondary school music, problems in administration and teaching of music in secondary school; relationship of music with humanities in curriculum. Sequel to 3150.

5210 Psychological Foundations of Music (3) Perception; function; aesthetics; talent measurement; implications for teaching theory and practice. Prerequisite: Consent of instructor. 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.

5240 Evaluation Procedures in Music Education (3) Tests, measurements, and evaluation of musical development of students at all levels. Standard educational measurements and teacher-made tests applicable to music and special evaluative techniques for use in classroom situations. Uses of musical appraisal and achievement tests. Statistical measures applied to learning music. Prerequisite: General psychology, educational psychology, and elementary statistics. Su

5250 The Role of Music in Education (3) For school administration and teachers in music education, on the role of music in public education. No previous experience in music required. Su

5260 Music for Early Childhood (3) Prerequisite: 3120 or 3130 or consent of instructor.

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. Prerequisite: 3120 and 3130 or consent of instructor.

5320 Advanced Choral Literature and Conducting (3) Reading, conducting, and interpreting vocal scores suitable for school, college, church, and community groups; emphasis on contemporary and standard major choral works. Prerequisite: Undergraduate degree with a major in music or music education; 4450, 4510 or equivalent.

5350-69-70 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. Prerequisite: 5710 or equivalent and consent of instructor. E

5410 Advanced Band Literature and Conducting (3) Reading, conducting, and interpreting band scores suitable for school, college, and community bands. Emphasis on modern, contemporary and standard band literature. Prerequisite: Undergraduate degree with a major in music or music education; 4430 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. Prerequisite: Consent of instructor. F, W, Sp

5710 Research in Music Education (2) Prerequisite: 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. Prerequisite: Admission to M.S. program.

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. Prerequisite: Admission to M.S. program.

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. Prerequisite: Admission to M.S. program.

5840 Seminar (3) Music teaching in vocal, theoretic-al, historical, and appreciation area of the secondary school curriculum. Survey of current professional literature and development of bibliography. Laboratory activities. Projects. Prerequisite: Admission to M.S. program.

Continuing and Higher Education

MAJOR DEGREE

Adult Education M.S.

College Student Personnel M.S.


Associate Professor: M. G. McInnis, Jr. (Head), Ph.D. Florida State.

Assistant Professor: W. D. Barton, Tennessee.

The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community education 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 45 hours. For each option, 9 hours must be completed 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. Prerequisite: Consent of instructor. S/NC only.

5000 Thesis (1-15) P/NP only. 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

5060 Adult Education: A General Survey (3) Historical development, philosophies of adult education, agencies, programs, current issues, and literature of adult education. F, Sp

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

5350-70-80 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 student personnel services in public higher education. Student discipline, housing, dress, organizations, activities, fees, tuition, and related federal regulations.

5430 College and University Law—Tort Liability and Risk Management (3) Legal precedent concerning liability exposures of public institutions in higher education. Personal and institutional liability. Basic principles of risk management and liability insurance. Prerequisite: 5410 and 5420, or consent of instructor.

5440 American Higher Education (3) Functions, organizations, and programs. F, Sp

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.

5510 Governance of Colleges and Universities (3) Development, change, trends, process, and structure of collegiate governance. F

5550 Fiscal Problems in Higher Education (3) Revenue sources and fiscal management in public and private colleges and universities. Sp

5660 Program Planning in Continuing and Higher Education (3) Theories and method for planning adult education programs. W

5750 Student Personnel in Higher Education (3) Philosophy and scope.

5770 Case Studies in College Student Personnel (3) Prerequisite: 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, F, Sp

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) Analysis of problems and issues confronting professionals in fields of adult or higher education. E

5990 Practicum in College Student Personnel (3) Prerequisite: 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 programs planned in continuing and higher education. Prerequisite: 5960 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., EdD.

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 Ph.D.
graduates of 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, and 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, 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 48.

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

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

4220 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, integration, 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 program. Emphasis on elementary school and 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.

4674 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 4750 and Vocational-Technical Education 4750.) E

4860 Programmed Learning (3) Theories of learning as related to technology of programmed instruction; techniques and applications of programming. Prereq: Psychology 3260, or consent of instructor. (Same as Psychology 4860.) 2 hrs and 1 lab.

5000 Thesis (1-15) P/NP only. 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 evaluation 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) Choosing 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) Philosophical 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 policy proposals of the major philosophic schools of thought. Prereq: Consent of instructor.

5141 Pragmatism in Education (3) Effects of American pragmatist 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 considered in light of recognizing student's educational goals and curriculum.

5150-70 Seminar (1-3, 1-3, 1-3) Curriculum, elementary education, secondary education, or social foundations as they relate to goals of students' programs. Maximum 7 hrs. S/NC only.

5180-90-200 Seminar Educational Specialist Research and Thesis (3, 3, 3) P/NP only.

5210 Seminar in International Education: Asia and Africa (3) Historical, philosophical, and sociological foundations; 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 studies. 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.

5230 Advanced Study and Practicum in Diagnosis and Remediation of Learning Disabilities (3) Assessment and practicum experience with students having corrective and remedial arithmetic needs. Prereq: 12 hrs of S/NC only.

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

5250 Secondary School Instruction (3) Persistent instructional problems in secondary schools.

5260 Philosophy of Education (3) Truth, knowledge, and valuation in relation to work of schools. Prereq: 3010, Educational Psychology 2403 or 3819, 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) Recent trends in methods, materials and content. Not available for credit to persons completing recent elementary language arts methods courses. Prereq: 12 hrs of 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.

5262 Teaching Science in the Elementary School (3) A study of the elementary science curriculum and content that is available for credit to persons completing recent elementary science course. Prereq: 12 hrs in science or consent of instructor.

5263 Programs and Materials in Teaching Elementary Science (3) Analysis of new and innovative science program materials; methods of differentiating instruction; use of modern classroom science program. Prereq: 3720 or equivalent, or consent of instructor.

5284 Seminar in Teaching Elementary Science (3) Analysis of current curricular issues. Prereq: 5262 or 5281, at least the five year teaching experience; or consent of instructor.

5290 Teaching of Mathematics in the Elementary School (3) Trends in methods, materials, and content. Not available for credit to persons completing recent elementary mathematics course. Prereq: Consent of instructor. F, Su

5291 Programs and Materials in Elementary School Language Arts (3) Programs and special inservice experiences related to the teaching of reading with language arts. Prereq: 3260 or equivalent, or consent of instructor.

5292 Seminar in Research and Theory in Teaching Mathematics in the Elementary School (3) Analysis and integration of current research and theory and their application 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, related theories and research on reading and the 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) Research and development of programs, selection and use of materials for 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 issues and trends 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 improve current practice. Prereq: 5580 or consent of instructor.

5360 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 6 hrs. S/NC only.

5365 Mathematics Laboratories in Elementary School (3) Experiences for teachers dealing with activity-oriented mathematics laboratory materials and pedagogical strategies. Theoretical considerations, philosophy of curriculum and materials for laboratory. Prereq: Consent of instructor. Sp, Su

5379 Diagnosis and Correction of Classroom Reading Problems (3) Instruction, diagnosis, and materials. A student who has completed 4280 may not enroll without consent of instructor. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 6 hrs.

5380 Practicum in Diagnosis of Reading Problems (3) Application of principles of learning and teaching methodology in working with elementary and/or secondary school students. Prereq: Credit for case study reports, and conducting parent conferences. Prereq: Course in diagnosis and correction of reading problems or consent of instructor. May be repeated. Maximum 6 hrs.

5381 Practicum in Remediation of Reading Problems (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

5382 Developmental Reading Practicum (3) Diagnosis and correction of reading needs. Prereq: Courses 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) Special conferences, workshops, and inservice 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 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and insights in our society and others. (Same as Anthropology 5510.)

5511 Non-Western Education: Anthropological Approaches (3) (Same as Anthropology 5511.)

5532 Curriculum and Assessment (3) Conceptual and methodological aspects of curriculum design and development. Prereq: 5540 or 5270 or consent of instructor. E

5610 Educational Statistics (3)

5620 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.

5630 Individualization of Instruction (3) Practical experience in designing individualized activities and materials. Prereq: 5530 and 5900 or consent of instructor.

5640 Newer Trends in Elementary Education (3) Trends in classroom procedures, equipment, and materials of instruction; problems involving improvement of instruction. W, Su

5650 Curriculum Laboratory for Elementary Schools (3-6) Workshops and in-service programs to improve instruction of teachers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only.

5670 Curriculum for Early Childhood (K-3) (3) Sp, Su

5680 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

5690 Design of Instructional Media (3) Design and application of instructional development model to arrive at solutions to institutional problems, development of design of instructional sequence or module, using appropriate media in actual learning setting. Prereq: 4750 or consent of instructor.

5691 Advanced Production of Audiovisual Software (3) Lettering, overhead projects, masking, preserving, synchronizing, photography, nonphotographic slides, and video editing for producing classroom audiovisual software. Prereq: 5680 or consent of instructor, Library and Information Science 4750 or equivalent. (Same as Library and Information Science 5691.)

5692 Evaluation of Instructional Media (3) Evaluating and recycling media prototypes to meet needs and objectives of learners. Prereq: 5691 or consent of instructor.

5693 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, Library and Information Science 5691.

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.

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 Psychological Education 5790.)

5801 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 methods 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 for teaching, materials suitable for individualized instruction, mathematical laboratories, and independent study. Prereq: 1 year teaching experience (mathematics grades 7-12) or consent of instructor. Sp

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) Curr
niculum and teaching problems. Methods of teaching "analysis" courses such as Algebra II, trin
gonometry, analytic geometry and calculus. Prereq: 3751-52 or equivalent. F, Su
5841 Trends and Issues in Early Childhood (3) Historical background; trends, and issues as basi
on evaluating current programs; materials and techni-
ques of teaching. F, Su
5842 Applications of Theory in Early Childhood Education (K-3) (3) Principles and practices from sev-
eral theoretical orientations for young children (K-3). Teaching strategies, materials and evaluation meth-
ods. 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 meth-
ods 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 re-
gard to mathematics, content materials and function-
al instructional aids, and teaching strategies for development of mathematical ideas. Prereq: 3350 or equivalent. Su
5845 Social Studies and Science in Early Childhood Education (K-3) (3) Integrative approaches to ana-
lysis of curriculum systems of content and areas of social studies and science for early childhood.
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 Educa-
tion (K-3) (3) Language development of young learn-
ers with emphasis on teaching methods, proce-
dures, program and materials in early childhood lan-
guage arts program. Prereq: 3260 or equivalent or consent of instructor.
5899 Field Experience (1-6) Application of curricu-
lar and instructional principles, methods, and mate-
rials in schools. Program prerequisites must be met, and consent of instructor required. May be repeated. Maximum 12 hrs. S/NC only.
5900 Seminar in the Teaching of English in the Second
ary School (3) Su
5901 Linguistics and the Teacher of English (3) Analysis and application of linguistics in the class-
room. Prereq: 2305.
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 selec-
tions. F
5904 Teaching the Mass Media in the English Class-
room (3) Nature of mass media and impor-
tance to American education and life. Sp
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. F
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 teach-
ing skills of speaking and listening. Sp
5909 Instructional Theory and Design (3) instruc-
tional process and relationship to curriculum and learn-
ing. Prereq: Consent of instructor.
5910-20-30 Problems in Lieu of Thesis (3, 3, 3) S/NC only.
5911 Directing the Forensic Program (4) (Same as Speech 5911.)
5912 Play Production in Secondary Schools (4) (Same as Theatre 5912.)
5950 The Function of the Thinking Process in Education (3) Analysis of thinking processes and pur-
pose of tracing its implications for education theory and practice.
5960 The Teaching of Natural Science (3) Strategies, laboratory techniques, testing and eval-
uation, professional guidelines for middle, junior and senior high schools, community colleges. Prereq: Consent of instructor.
5961 Seminar in Science and Environmental Education (3) Recent developments in science edu-
cation. Interrelationships of major environmental factors on science education for middle, junior and senior high schools, community colleges. Prereq: Consent of instructor. W
5962 Studies in Energy Education (3) Major and alternative energy sources with applications for de-
velopment of energy educational programs and materials; special emphasis on science taught in schools including community colleges. Prereq: 5961 or consent of instructor.
5970 The Teaching of the Social Studies (3) Su
5980 Projects, Programs, and Materials in Social Studies (3) Leaders associated with each social science discipline.
6000 Doctoral Research and Dissertation (3-15) Prereq: Consent of instructor.
6010 Studies in English Education (3) Reading and study in areas of teaching of English:
composition, language, and literature. Su
6020 Seminar in Teaching the Social Studies (3) Problems associated with classroom instruction in junior and senior high schools. Su
6030 Research and Theory in Teaching Reading (3) Research and theory in application to teaching of reading; research design as it applies to reading in-
vestigations. Prereq: Two 5000-level courses in reading. W
6031 Seminar in Reading and Language Arts (3) Topics new to reading and language arts cho-
sen 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 Read-
ing Programs (3) Synthesizing instructional and learning components of reading into classroom, school, and system programs. Prereq: 2 5000-level courses (preferably 5304 or 5304D) in reading education or consent of instructor.
6040 Seminar in Curriculum and Instruction (1) Required three quarters. S/NC only. E
6060 Advanced Studies in Elementary Education (3) Critical analysis of research as it applies to class-
room practice. Prereq: 5710 or 5800; 12 hrs. at graduate level; or consent of instructor. W
6080 Advanced Seminar in Philosophy of Educa-
tion (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 educa-
tion.
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/NC. E
6091 Independent Study (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. E
6092 Supervised Readings (1-6) Topics to be assigned. May be repeated. May be offered for letter grade or S/NC. 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) Recent research in elementary school 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 selection, analysis, publication and relation of find-
ings to professional assignments. Prereq: 5800 or 5710 or equivalent.
6250 Seminar in History of Education (3) May be repeated with consent of instructor.
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 generation of provi-
sion of additional preparation of teachers for American elementary and secondary schools; current and historical trends and issues; in-
ovations and directions for future.
6400 The Dynamics of Educational Change (3) In-
terdisciplinary approach to change process in educa-
tion. 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, or selected aspects of 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.
6610-20-30 Seminar in Dissertation Proposal Writing (1, 2, 2) Prereq: 5830. Preparation of disserta-
tion proposals. Prereq: Completion of at least one research competency or consent of instructor. S/NC only.
6670 Advanced Educational Statistics (3)
6720 Interpretation of Data (3) Types of data in relationship to scientific education, principles of sound interpretation.
6731 Advanced Studies in Curriculum (3) Analysis of influential curriculum theories and approaches, structural and historical, and theoretical frameworks. Prereq: 5580 and 5350 or equivalent.
6880 Studies in Mathematics Education (3) Read-
ing and study related to historical trends and issues in mathematics education in United States providing broad perspective on current curricular problems and future trends. Prereq: 5830 or consent of in-
structor.
6885 Principles of Educational Leadership (3) Concepts and procedures, with application to major prob-
lems in instruction, supervision, and administration.
**Education**

**DEGREE**

**Major**

**Education**

**5001 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/N only.

**Educational Administration and Supervision**

**Major**

**Degree**

**Educational Administration and Supervision**

**Education**

**600 Internship in Educational Administration (3)** Advanced level experiences in application of principles and practices of curricular development and instructional improvement. Program prerequisites must be met and consent of instructor required. May be repeated. Maximum 12 hrs. S/N only.

**6960 Advanced Studies in Secondary Science Education**

May be repeated. Consent of instructor.

**5960 or equivalent, consent of instructor.**

**6960 Advanced Studies in Secondary Science Education**

Special emphasis on leadership structures, operational beliefs, and communication of ideas with regard to community decisions concerning education. F, Sp, Su.

**5290 The Politics of Education (3)** Special emphasis on leadership structures, operational beliefs, and communication of ideas with regard to community decisions concerning education. F, Sp, Su.

**5310 School Administration and Civil Rights Issues (3)** To help school administrators meet responsibilities and solve problems stemming from civil rights legislation pertaining to race, sex, and the handicapped. A.

**5420 District Level Administration (3)** Role of central administration team, and relationships, behaviors, and competencies to develop an effective school organization. F.

**5430 Building Level Administration (2)** 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 affects daily building level operations; building level methods of fiscal and logistical support measures. Sp, 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, Su.

**5460 Personnel Administration: Local School (3)** Planning personnel needs; job analysis; recruitment; selection; placement; orientation of new staff; fair employment and dismissal; and contract administration for both professional and supporting staff. Sp, Su.

**5470 Introduction to School Facility Planning (3)** For school administrators; facility planning skills in building planning, use 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 function through both qualitative and quantitative planning techniques. Relating educational policy analysis to educational planning. W, Su.


**5550 Research for Educational Administrators (3)** Descriptive, experimental, and quasi-experimental designs to help student without quantitative background to read and understand technical literature. Primarily for nontechnology option students. Should be taken early in M.S. or Ed.S. program. W, Su.

**5560 Seminar in Communication Skills for Educational Administrators (3)** Identification, development and utilization of language skills, interpersonal, and group related communication skills. F, Sp, Su.

**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: Preparation Programs (3)** May be repeated. E.

**5715 Problems in Educational Administration and Supervision: Community Education (3)** Independent study of administrative problems. May be repeated. E.

**5716 Problems in Educational Administration and Supervision: Theory (3)** May be repeated. E.

**5720 Problems in Educational Administration and Supervision: Finance (3)** May be repeated. E.

**5754 Problems in Educational Administration and Supervision: Business Management (3)** May be repeated. E.

**5755 Problems in Educational Administration and Supervision: Personnel (3)** May be repeated. E.

**5756 Problems in Educational Administration and Supervision: School Law (3)** May be repeated. E.

**5759 Problems in Educational Administration and Supervision: School Plant (3)** May be repeated. E.

**5760 Problems in Educational Administration and Supervision: Building Operations (3)** May be repeated. E.

**5770 Maintenance of School Plants (3)** Skills in operating school custodial and maintenance programs. W.

**5810 Survey Research Methods (3)** Overview of descriptive studies, data collection, analysis, and interpretation, for survey studies and school surveys, strategies for descriptive research in education. F, Su.

**5850-60-70 Independent Study in Educational Administration (3, 3, 3)** Prereq: Consent of instructor.

**5960 Advanced Studies in Secondary Science Education**

Special emphasis in teaching educational administration or for school administrators. Primarily for nonthesis option students. Should be taken early in M.S. or Ed.S. program. W, Su.

**5970 Secondary Administrators Seminar (3)** For
in-service training of secondary school administrators, Development of problems, programs, and trends of secondary schools and management skills of secondary school administrators. Prerequisite: Presently a secondary school administrator or consent of instructor. May be repeated. S/NC only. F

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6040 Seminar in Educational Administration and Supervision (1) Required three consecutive quarters. S/NC only. E

6100 Internship in Educational Administration (3) May be repeated at discretion of student's committee. Opportunity for doctoral students and advanced graduate students to gain experience in performance of critical tasks of educational administration under supervision of practitioner and university representative. E

6110 Administrator Update (3) Current topics of concern to practicing school administrators, selected each quarter and presented by a specialist. Prerequisite: Presently a school supervisor or administrator, or consent of instructor. May be repeated. S/NC only. E

6190 Administration in Higher Education (3) Developing conceptual understanding of administrative theory and practice in higher education. F, Su

6220 Programs for the Professional Preparation of Educational Administrators and Supervisors (3) A

6340 Current Trends in School Law (3) Logical arrangement of case and statutory matter for public school administration; in-depth examination of problems of the school and public education. W, Su

6380 Instructional Supervision—School District (3) Definition and analysis of instructional supervision at the school district level. Supervisory operations including goal development; curriculum development; instructional support, help and service for teachers and administrators; personnel development; program evaluation. W, Su

6420 School Board-Superintendency Relations (3) The local unit of school administration, school district and its governing body, board of education or school board. Sp

6440 School Business Management (3) Emphasizes sophistication in construction and operating educational facilities; related research in education, sociology, and political science. One field inquiry. Prerequisite: 5250, 5610 or equivalent or consent of instructor. W

6550 Department of Education Administration and Supervision (3) Prerequisite: 6580 or equivalent or consent of instructor. W

6580 Seminar in Managing Conflict (3) Learning about and experiencing various forms of conflict. W, Su

6750-60-70 Independent Studies in Educational Administration and Supervision (3, 3, 3) Prerequisite: Consent of instructor. May be repeated. E

6800 Administration of Complex Educational Organizations (3) Concepts and theoretical formulations to understand, analyze, evaluate, and change complex educational organizations. W, Su

6870 Advanced Study in School Facility Planning (3) In-depth study and analysis of development of educational specifications and techniques of leadership in creation of quality educational facilities. W

6900 Special Topics (3) May be repeated. E

6981 Specialized Seminar: School Operation (3) E

6982 Specialized Seminar: Higher Education (3) Current policy development, organizational relationships, and administrative issues in higher education. Sp

6983 Specialized Seminar: State School Administration (3) E

6984 Specialized Seminar: Preparation Programs (3) E

6990 Specialized Doctoral Seminar in Politics of Education (3) In-depth study and analysis of impact of educational policies; implications for further research; application of existing knowledge to known school setting. Prerequisite: Consent of instructor. A

6991 Specialized Seminar: Theory (3) E

6992 Specialized Seminar: Finance (3) E

6994 Specialized Seminar: Business Management (3) E

6995 Specialized Seminar: Personnel (3) E

6996 Specialized Seminar: School Plant (3) Theory and practice in planning and operating educational facilities; related research in education and other disciplines; implications for further research; application of existing knowledge to known school settings. Prerequisite: Consent of instructor. A

6997 Specialized Seminar in Organization and Structure (3) Organizational theories in education including systematic review of status of organization and leadership research in education and related disciplines; implications for further research; application of existing theory and research to known educational settings. Prerequisites: Consent of instructor. A

6998 Specialized Seminar: School Law (3) E

6999 Specialized Seminar: Supervision (3) Sp

**Educational and Counseling Psychology**

**MAJORS**

**DEGREES**

Guidance

M.S.

M.A.

Ph.D.

Education

M.S.

Ed.D.

Ph.D.

Educational Psychology

Ed.S.

Ph.D.

Educational and Guidance

Ph.D.

Ph.D.

Psychology

Ph.D.

Psychology

Ph.D.

**Professors:**


**Associate Professors:**

M. A. Hector, Ph.D. Michigan State; L. M. Kindall, Ed.D. Tennessee, A. McIntyre*, Ph.D. Yale; N. M. Meara, Ph.D. Ohio State; M. P. Patel of 1, Ph.D.

**Ph.D. Ohio State:** R. S. Saudargas, Ph.D. Florida; K. K. Swander, Ph.D. Florida.

**Assistant Professors:**


Graduate programs (thesis or non-thesis option) lead to the Master of Science degree with a major in Educational Psychology with concentration areas in educational psychology, in school psychology, and in community agency counseling; the M.S. degree in Guidance has concentrations in elementary or secondary guidance; the Specialist in Education and the Doctor of Education degree in higher education.

Applicants for admission to graduate study in the College of Education/Counseling Psychology with a major in Education includes options and emphases as listed on page 48. 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 mental health criteria to a study of one's self based on a battery of personality assessment instruments.

**4320 Self-Management for Personal and Professional Development (3)** Applications in career, social, emotional, and physical development. Theoretical and experiential activities. Prerequisite: Introduction to psychology or consent of instructor. Letter grade or S/NC.

**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)** Prerequisite: 2430 or equivalent. E

**4460 Standardized Testing (3)** Use and interpretation of standardized group instruments in assessment of intelligence, aptitude, achievement, vocational interests, and personality adjustment. E

**4650 The Construction of Classroom Tests (3)** Concerned with teacher-made classroom tests: instructional objectives, principles of test construction, item analysis, evaluation of a test's reliability and validity, determination of test scores, relationship between testing and grading. W, Su

**4760 Advanced Child Study (3)** Prerequisite: 2430 or 2610 or consent of instructor. W, Su

**4890 Psychology of the Disadvantaged Child (3)** Significant behavioral differences and causes, appropriate intervention approaches. F

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*Adjunct.

Part-time.
5800 Organization and Administration of Pupil Personnel Programs (3) Basic principles, procedures, and policies. F, W, Sp; 5460 or 5610, or consent of instructor. Sp, Su

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6040 Seminar (1) Required in fall quarter. Maximum 3 hrs. S/NC only. F

6099 Internship (1-6) Supervised employment at departmentally-approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.

6110 Application of Research Design (3) Research design and statistical analysis unique to educational psychology, counseling, and college student personnel. Emphasis on designs “experimental” in nature. Prereq: 2 courses in statistics or consent of instructor. F, Sp

6120-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2) Preparation and evaluation of dissertation proposals. E

6130 Seminar in Counseling (3) Selected counseling theory, topics, issues. Prereq: 5890 or consent of instructor. May be repeated. F, W, Sp

6180-60-60 Seminar in Professional Issues (1, 1, 1) Job selection, convention participation, publishing, grant proposals, consulting, etc. For final year doctoral students only. S/NC only. W, Sp

6190 Special Topics Seminar (3) Exploration of current research in psychological 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

6213-33-33 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. May be repeated with consent of department. Maximum 6 hrs.

6215-60-60 Theory and Practice of Consultation (3, 3) (Same as Psychology 5590-60.)

6319 Field Work in School Psychology: Level I (3) (Same as Psychology 5319.) S/NC only.

6320 Advanced Classroom Behavior Modification (3) Current research in psychology and its application to educational problems. E

6330 Theory and Research in Human Learning (3) Contemporary learning theory; current research and its influence upon school practice. F

6331 Current Developments in Human Learning (3) Sp

6340 Group Dynamics (3) Principles of group dynamics as they apply to a variety of group settings. E

6350 Educational Applications of Cognitive Theories (3) Developmental theory of Jean Piaget and implications for education. Related theories such as Bruner and Ausubel. E

6356 The College Student (3) Nature, characteristics, and needs.

6370 Evaluation in Education (3) Techniques and instruments for identifying and appraising social values, the thinking processes, social adjustment, emotional and educational development, and vocational interests. E

6375 Career Development: Theory and Research (3) F, Su

6378 Career Development: Program Development Implementation and Evaluation (3) Career development and pre-vocational programs and projects, K-adult with emphasis on development, implementation, and evaluation. Prereq: 5760 or equivalent, or consent of instructor. Sp

6379 Career Development: Workshop (1-6) Designed for in-service training of school personnel. Developments, programs, and trends related to career development. May be repeated. Maximum 6 hrs. (Same as Curriculum and Instruction 5780 and Special Education 5780.)

6380 Student Appraisal (3) Gathering, interpreting, and using data for development of guidance programs and individual counseling. Prereq: Educational Psychology or Psychology 4640 or equivalent in standardized testing. (Same as Psychology 5840.) W

6380-60-70 Special Topics and Problems (1-6, 1-6, 1-6) Not to be taken to fulfill regular 600-level course requirements. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. May be taken for letter grade or S/NC. E

6381 Seminar in Counseling (3) Selected counseling theory, topics, issues. Prereq: 5890 or consent of instructor. May be repeated. F, W, Sp

6384-50-60 Seminar in Professional Issues (1, 1, 1) Job selection, convention participation, publishing, grant proposals, consulting, etc. For final year doctoral students only. S/NC only. W, Sp

6385 Field Work in School Psychology: Level II (2) (Same as Psychology 6319.) S/NC only.

6400 Group Counseling Practicum (3) Supervised practice in counseling in elementary or secondary school guidance and/or student personnel work. Prereq: 4640, 5060 (or 5340), 5890, 5897 or consent of instructor. May be repeated. Maximum 6 hrs. for each course. E

6490 Group Counseling Practicum (3) Supervised practicum with children and/or adults. Prereq: 5340, 5890, 5897, and 5840 and consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

6491-42-43 Practicum in Guidance, Counseling, and Personnel Services (3, 3, 3) Supervised practicum in selected areas of guidance and counseling. Minimum: 90 clock hours each quarter. Prereq: 5890 and consent of instructor. E

6494-45-46 Teaching Practicum (3, 3, 3) Prereq: Admission to doctoral program and consent of instructor. May be repeated. Maximum 6 hrs. for each course. E

6495 Counseling Supervision (3) May be repeated with consent of advisor. Prereq: 5890, 5940, 6810, 6941. S/NC only. E

Related courses are offered in departments of psychology and education, educational psychology, counseling, and college student personnel. Prereq: 6110 or equivalent. W, Sp

6500 Theory and Practice of Consultation (3) (Same as Psychology 5590-60.)

6592-46-47 Practicum in Guidance, Counseling, and Personnel Services (3, 3, 3) Supervised practicum in selected areas of guidance and counseling. Minimum: 90 clock hours each quarter. Prereq: 5890 and consent of instructor. E

6594-45-46 Teaching Practicum (3, 3, 3) Prereq: Admission to doctoral program and consent of instructor. May be repeated. Maximum 6 hrs. for each course. E

6595 Counseling Supervision (3) May be repeated with consent of advisor. Prereq: 5890, 5940, 6810, 6941. S/NC only. E

6560 Internship (1-6) Supervised employment at departmentally-approved internship sites. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.
Special Education and Rehabilitation

MAJORS

Vocational Rehabilitation Counseling

DEGREES

Vocational Rehabilitation Counseling (M.S.)

Professors:


Associate Professors:


Assistant Professors:


Instructors:


The Department of Special Education and Rehabilitation provides competency-based programs and experiences to prepare regular, special, 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 special 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. Course sequences may be 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 counselor education; (8) disability evaluation education; (9) general special education and rehabilitation.

Program of Study

The Certificate of Science degree in Special Education with an emphasis in one of the specialized areas.

Under the sponsorship of the Office of Special Education and Rehabilitation Services (O.S.), a specialized institute for the preparation of professionals to adapt their skills toward services to hearing impaired and deaf people is provided. For further information write the department head.

EDUCATION OF THE HEARING IMPAIRED


4190 Speech Development of Hearing Impaired (3) Anatomy and physiology of speech system, relationship of hearing to speech development. Theories and techniques of speech development and improvement for hearing impaired children. Prereq: (Same as Audiology and Speech Pathology 4190.) F, Su.

4200 Practicum in Speech Development of Hearing Impaired (3) Applications of theories and techniques of speech development and improvement with hearing impaired children. Prereq: 4190 and consent of instructor. (Same as Audiology and Speech Pathology 4200). W, Sp.

4210 Language Development of Hearing Impaired I (3) Systems by which formal language is presented. (Same as Audiology and Speech Pathology 4210.) F, Sp.

4220 Language Development of Hearing Impaired II (3) Techniques; various systems by which formal language is presented. Prereq or consent of instructor. (Same as Audiology and Speech Pathology 4220.) W, Su.

4230 Communication Processes for the Hearing Impaired I (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. Prerequisites: and psychology. (Student must acquire a degree of proficiency in use of manual language.) Prereq: Consent of instructor. E.

4231 Communication Processes for Hearing Impaired II (3) Intermediate course in manual communication skills and techniques with emphasis on vocabulary development with receptive and expressive fluency. Prereq: 4230 or consent of instructor. A.

4240 Nature of Hearing Impairments (3) Basic principles of audiology; anatomy and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing level; interrelationships between hearing and non-hearing aspects of hearing impaired person; selection and use of hearing aids; relation of audiologic services to medical and other rehabilitation disciplines. Prerequisites: and permission of instructor.

4250 Introduction to the Psychology and Education 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 studies relating to psychology, social adjustment, and learning of deaf. Survey of professional literature in area of deaf child and adult. Prereq: 4240 or consent of instructor. F.


4290 The Teaching of Reading to Hearing Impaired Children (3) Readiness activities, developmental approaches, techniques, and specialized materials for curriculum in teaching reading. W, Su.


5220 Linguistics in the Education of the Hearing Impaired (3) Recent research and developments in linguistics related to hearing impaired. F, 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 deficits. Prereq: Consent of instructor. Must be taken in sequence. F, Su; W, Su; F.

5490 Educational and Vocational Guidance of the Deaf and the Hard of Hearing (3) Evaluation; test techniques for diagnosis and guidance; social and personality adjustment; occupational opportunities. F, Sp.


EDUCATION OF THE MENTALLY RETARDED

4110 The Nature and Concept of Mental Retardation (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 materials in special and regular classes. Prereq or coreq: 4110. E.

4440 High School Program for the Mentally Retarded (3) Trends, issues, and research relating to core and work study programs. E.


4922 Student Teaching of the Educable Mentally Retarded (3) Observation and supervised practicum. S/NC only. E.

5111 Psychology of Mental Retardation (3) Intelectual functioning, psychological theories and learning interrelations and theoretical and educational implications emphasized. Prereq: 4110. F, Su.

5112 Psychology of the Severely Mentally Retarded (3) Program and curriculum development for training/education of severely retarded in public schools, institutions and privately operated schools and workshops. Su.


MULTIPLE DISABILITIES

4120 Education of the Brain-Injured Child (3) Nature of brain-injured child; skills for indentifying educational, physical, and emotional characteristics; special educational techniques. E.

4160 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.

4840 Educational Problems of the Cerebral Palsied Child at Home and School (3) Physical, social, and educational needs of cerebral palsied pupils; evaluation techniques; recent developments. E.

4921 Student Teaching in Crippling and Special Health Conditions (3-15) Observation and supervised practicum in home, hospital, and classroom. S/NC only. E.

EDUCATION OF THE EMOTIONALLY DISTURBED

4610 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and socially disturbing behavior, degrees of severity, possible causes, and relationships to each other. Relationships with respect to 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) Management behaviors, models for instruction, teaching techniques and materials, and teacher-pupil family interpersonal relationships as basic to academic achievement for the pupil. Prereq: 4610. W, Su.

4630 Practicum in Residential Settings Serving Children with Disturbing Behavior (3) Practicum in scientifically identifying, individualizing, and reinforcing disturbing behaviors. Initiating behavior changes regarding academic and social behaviors. To perform in a work-study capacity within a residential classroom and to take part in discussion and evaluation of 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 (3) Academic tutoring in a teacher aide capacity within regular classrooms. Particular emphasis and practice in individualizing instruction for learning and behavior problem children. Techniques used in 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 (3-9) Tutoring and classroom observation and teaching of emotionally disturbed individual. Prereq or coreq: Curriculum and Instruction 4720 or 4820. S/NC only. A

REHABILITATION COUNSELOR EDUCATION

5100 Orientation to Rehabilitation (3) History, philosophy, and legal bases for rehabilitation movement; case finding, intake, diagnosis, physical restoration, vocational placement, follow-up; relation to programs of allied agencies, rehabilitation teams, facilities and programs in hospitals, institutions, community agencies, and service groups. Attention to specialization in disability categories such as mentally ill, mentally retarded, and blind. F

5115 Case Load Management in Rehabilitation (3) Techniques and procedures involved in management of caseloads in state rehabilitation agencies and public or private rehabilitation facilities; analyses of appropriate industrial management models related to rehabilitation programs; and simulated experience in work planning, decision making, and case selection. W

5120 Psychosocial Aspects of Disability (3) Medical aspects and psychological impact of major disabling handicaps; care and education of persons with disabilities, including implications of family and community. Sp

5121 Job Development and Placement in Rehabilitation (3) Identifying work for handicapped persons; utilization of occupational resource materials and techniques including field experiences for analyzing jobs, procedures necessary for helping a handicapped individual successfully adjust to a work environment and assessment of future trends within labor market. Su

5130-40 Seminar in Rehabilitation (3, 3) 5141 Diagnostic Vocational Evaluation in Rehabilitation (3) Process, principles, and techniques used to diagnose vocational assets and liabilities of handicapped persons including evaluation of biographical data and use of evaluation interview. W

5142 Prognostic Vocational Evaluation in Rehabilitation (3) Process, principles and techniques used to determine and project work behavior and vocational potential. Includes rationale underlying selection and use of occupational evaluation programs, situational tasks, simulated work experiences, and job tryouts in vocational evaluation. Prereq: 5141 Sp

5143 Interpretation of Vocational Evaluation Data in Rehabilitation (3) Procedures, principles, and techniques used in interpretation of vocational evaluation data to handicapped adults, to referral agency, and to facility staff. Interpretation of data through formal staff conference, vocational counseling report writing, and follow-up. Prereqs: 5141 and 5142. Su.

5144 Development and Supervision of Client Evaluation Programs (3) Procedures involved in establishment and maintenance of effective vocational evaluation programs. Determining and planning amount of floor space, type of equipment, type and number of staff, and lines of communication essential to maintenance of vocational evaluation programs. Effective supervisory, referral, recording, budgeting, and staff development practices. Prereqs: 5141, 5142, 5143, or consent of instructor. Wi

5145-46-47 Practicum in Rehabilitation (3, 3, 3) Supervised experience in area of rehabilitation with emphasis on application of concepts, principles, and skills acquired in previous or concurrent course work. Prereq: Consent of instructor. W; Sp; Su

5150-60 Internship in Rehabilitation (9, 9) 5170 Systematic Human Relations Training (3) Active listening, observing verbal and nonverbal behavior, empathetic understanding, and communicating with handicapped individuals. F

5180 Approaches to Rehabilitation Counseling (3) Applications and techniques used in counseling handicapped 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) Techniques and principles related to evaluating and mobilizing of community resources and service integration with emphasis on social and rehabilitation facilities and agencies. Assessment utilization and mobilization of community resources to facilitate development of innovative service programs for handicapped. W

5710 Medical Aspects of Disability I (3) Etiology, clinical signs, symptoms and diagnostic procedures 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 impairments and administration of appropriate rehabilitation services. W

5720 Medical Aspects of Disability II (3) Etiology, clinical signs, symptoms and diagnostic procedures related to neoplastic, skin, digestive, genito-urinary, endocrine, mental, visual and hearing 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 the 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 program or structures, and innovation, exploration of alternatives, and sharing experience within group. Prereq: 5700 or consent of instructor. W

5760 Seminar: Functional Capacity Assessment (3) Criteria for residual functional capacity assessment in disability insurance claims evaluation; 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) Current problems in process, content, or administration of disability claims evaluation process or structures or administration of alternative solutions. May be repeated with consent of instructor. S/NC only. A

SCHOOL SPEECH AND HEARING THERAPY

4320 Introduction to Clinical Practice in Speech Pathology (3) (Same as Audiology and Speech Pathology 4320.) S/NC only.

4330 Clinical Practice in Speech Pathology I (1-6) (Same as Audiology and Speech Pathology 4330.) S/NC only.

4340 Clinical Practice in Speech Pathology I (1-6) (Same as Audiology and Speech Pathology 4340.) S/NC only.

4341 Clinical Practice in Communication Disorders in Schools (3) Prereqs: 4300, 4320-30-40 and consent of instructor. S/NC only. F, W, Sp

4342 Seminar in Communication Disorders in Schools (3) Prereqs: 4300, 4320-30-40 and consent of instructor, F, W, Sp

4400 Voice Disorders I (4) (Same as Audiology and Speech Pathology 4400.)

4720 Audiology II (4) (Same as Audiology and Speech Pathology 4720.)

4930 Aural Rehabilitation: Speechreading and Auditory Training (3) (Same as Audiology and Speech Pathology 4930.)

4940 Introduction to the Verbo-Tonal System (4) (Same as Audiology and Speech Pathology 4940.)

5040 Advanced Clinical Practice in Audiology Study and Practice (1-6) (Same as Audiology and Speech Pathology 5040.)

5380 Cerebral Palsy (3) (Same as Audiology and Speech Pathology 5380.)

5390 Cleft Palate (3) (Same as Audiology and Speech Pathology 5390.)

5540 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540.)

EDUCATION OF THE VISUALLY HANDICAPPED

4160 Education of Partially Sighted Children (3) Curricular adjustments and materials; home visits for parents' cooperation in medical care and special needs. A

4850 Eye Problems Encountered by the Teacher (3) Eye anatomy and hygiene; common diseases and defects; testing and treatment; educational adjustments for specific eye conditions; related service resources. A

4923 Student Teaching of the Partially Sighted (3) Observation and supervised practicum in special and regular classroom settings. A

GENERAL COURSES

3333 Education of the Exceptional Child (3) Principles, characteristics, and special needs; local and state programs for diagnosis and care; educational programs in regular and special schools; home teaching; social and vocational guidance. E

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

5630 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 child. Current research concerning education and/or rehabilitation of exceptional persons. Prereq: Curriculum and Instruction 5800 or Educational Psychology 5210 and consent of instructor. A

5910-20-30 Problems in Lieu of Thesis (3, 3, 3) S/NC only, E

5970 Juvenile Delinquency and the School (3) Responsibilities of school in studying sources of maladjustment; school function in community programs for children’s welfare; curricular adjustments; directed study of socially maladjusted children, environment; and programs for meeting needs. A

**Vocational-Technical Education**

**MAJORS**

- Agricultural Education
- Business Education
- Distributional Education
- Industrial Education
- Vocational-Technical Education

**DEGREES**

- M.S., Ed.D.
- Ph.D.

**Professors:**
- J. I. Matthews (Head), Ph.D., Arizona State
- W. A. Cameron, Ph.D., Ohio State
- R. J. Woodin (Emeritus), Ph.D., Ohio State
- D. G. Craig, Ed.D., Cornell
- G. W. Wiegert, Jr., Ed.D., Missouri
- A. Wagoner (Emeritus), M.S., Indiana

**Home Economics Education:**

- J. Brown (Emeritus), Ph.D., Ohio State
- N. P. Logan (Emeritus), Ed.D., Tennessee
- R. W. Haskell, Ph.D., Purdue
- J. R. Reard (Emeritus), M.S., Oklahoma State

**Associate Professors:**

- H. O. Baker, Ph.D., Ohio State
- D. H. Morgan, Ph.D., Florida State
- S. W. Miller, Ph.D., Ohio State
- H. Stark (Emeritus), M.E., Colorado State
- D. V. Brown, Ed.D., Utah State
- P. E. H. Hanson, Ph.D., Purdue
- G. C. Petty, Ph.D., Missouri

**Assistant Professors:**

- H. O. Baker, Ph.D., Ohio State
- T. L. Powell, M.S., Oklahoma State

**THE MASTER’S PROGRAM**

The M.S. degree with a major in Vocational-Technical Education is available with concentrations in agricultural education, business and office 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 coordinators of the service areas. The MACT is available in the business education area.

**THE SPECIALIST PROGRAM**

The Ed.S. 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, as well as 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 48.

**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) P/NP only, 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

5005 Problems in Lieu of Thesis (3) May be repeated. S/NC only.

5010 History and Organization of Vocational-Technical Education (3) Vocational and technical education in public schools through analysis of social forces, legislation, and organization models.
5015 Issues and Trends In Vocational-Technical Education (3) Problems and innovations.
5020 Placement, Follow-up and Evaluation Procedures in Occupational Education (3) Methods and procedures in establishing placement programs, curriculum revision.
5030 Organization and Operation of Area Vocational-Technical Schools (3) Area vocational-technical school concept; administration and supervision of vocational and technical education programs in area schools.
5040 Guidance and Pupil Personnel Services in Education (3) (Same as Educational Psychology 5040).
5050 Supervision of Vocational-Technical Education (3) Program planning, coordination, instruction, roles and functions of supervisors.
5055 Vocational School Administration and Management (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, socio-economic, cultural, and/or other handicaps that prevent individuals from attaining proficiency 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 Education (1-6, 1-6, 1-6) May be repeated. Maximum 9 hrs.
5140 Individual Study Vocational-Technical Education (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 procedures and program- 
ming techniques. Hands-on experience in operating common microcomputers, writing, debugging, and running education programs. Prereq: Teaching, administrative, or related experience in schools or special consent of instructor.
5155 Software Design for Microcomputers in Education (3) Advanced BASIC software design: operating System-C/PM, TRSDOS and DSI, sequential and random I/O, analysis and operation of commercial educational programs, and teacher-designed programs. Prereq: 5150.
5180-90-200 Educational Specialist Research and Thesis (3, 3, 3) Selection, analysis, and completion of problem necessitating original investigation, beneficial to investigator and vocational-technical field. P/NP only.
6000 Doctoral Research and Dissertation (3-15) P/NP only. E
6010 Curriculum Planning in Vocational-Technical Education (3) Prereq: Curriculum and Instruction 5140 or equivalent.
6020 Program Planning and Development in Vocational-Technical Education (3) Planning vocational-technical and work force state, local, and institutional needs; research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.
6030 Evaluation of Vocational-Technical Education Programs (3)
6040 Seminar in Vocational-Technical Education (1) Three consecutive quarters during residency. S/NC only.
6050 Administration of Vocational-Technical Education (3) Administrative principles and relationships to vocational and technical training.
6111-12-13 Internship in Vocational and Technical Education (3, 3, 3) Field experiences in selected areas of vocational and technical education. S/NC only.
Agricultural Education
4320-44-46 Problems in Agriculture Business 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 Agricultural Education (3)
5220 Teaching Agricultural Mechanization in Vocational Agriculture (3) Prereq: 4350.
5250-31-32 Special Problems in Agricultural Education (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 Agricultural Occupations (3, 3) Developing occupational experience programs; course planning, teaching procedures. Prereq: 4350.
5260 Agricultural Education for First-Year Teachers (3) Adjustment to situation in which employed; group meetings in selected centers, and visits by instructor. Prereq: 4350.
5270 Adult Education in Agriculture (3)
5280 Supervised Occupational Experience in Agriculture (3) Prereq: 4350.
Business Education
5305 Methods and Materials for VOE Programs (3) Development of instructional aids, recent developments and research, individualized instruction, occupational clusters.
5306 Organization and Management of VOE Programs (3) Developing office occupations, guidelines in cooperatives, laboratory, and model office programs. Physical facilities, instructional aids, related instructional activities (clubs), enrollment, instructor and advisory committees.
5307 Measurement in Business Education (3) Evaluative methods and tools for all courses in business education and related areas of study in secondary and postsecondary business education.
5309 Evaluation of Research in Business Education (3) Prereq: Curriculum and Instruction 5610 or equivalent.
5310 Graduate Seminar in Business Education (3) Review of techniques for research and preparation 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 Business 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 Programs (3) Research, principles of learning, issues and materials.
5340 Improvement of Instruction in Shorthand/ 
Secretarial Skills (3) Principles of learning, 
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 Communications and Word Processing (3) Basics of and strategies for teaching written communications. Word processing and oral communications.
5390 Problems in Business Education (1-9) Variable 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)
6380 Higher Education for Business (3)

Distributive Education
4430-31-32 Problems in Distributive Education (1-3, 1-3, 1-3) Research problems in teaching and coordinating distributive education programs. May be repeated 3 times.
4440 Supervised Distributive Experience (3) Minimum 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 curriculum in secondary and postsecondary programs.
4460 Organization and Operation of Distributive Education Programs (3) Background and development needs, federal and state legislation; curriculum implications; establishing, evaluating, reporting, and improving programs.
4470 Methods and Materials in Distributive Education (3) Prereq: 4460 or consent of instructor.
4480 Coordination Techniques in Distributive Education (3) Selecting training agencies; job analysis; selecting and briefing training supervisors; advisory committees; adult and other community services. Prereq: 4460, 4470.
5410 Administration and Supervision of Distributive Education (3) Operation of distributive education program and work of city or county supervisor. Understanding and appreciating problems from high school principal's and department head's 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 Education (3) Planning, organizing, promoting, teaching, and evaluating continuing education programs in distributive education; utilizing trade associations, employment agencies, business groups, and advisory committees in implementation.
5430-31-32 Special Problems in Distributive Education (3, 3, 3) Individual research, conferences, and/or workshops in teaching and supervising high school, postsecondary, and adult programs.

Home Economics Education
5510 Organization of the Homemaking Curriculum in Secondary Schools (3) Recent advances in home economics education. Development of teaching material in relation 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 programs; techniques employed in evaluation. Techniques for determining progress of students; individual problems of evaluation.
5530-31-32 Problems in Home Economics Educa-
tion (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 for teaching 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, basic needs of individuals, techniques of interpersonal relations and social values in developing more effective teacher education programs.

Industrial Education

3830 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)

3850-61 Materials and Methods for Teachers of Shop and Related Subjects (3, 3)

3870 School Shop Safety (3)

4620 Special Topics in Drafting (3) Industrial practices in specialized areas of drafting selected for the individual student. Prereq: 6 hrs drafting.


4670 Manufacturing Processes (3) The manufacturing processes of industry and their relationship to careers. Prereq: 2620, 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, conversion, interrelationship 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 material in trade subjects, results of job analysis, checking sheets and individual job sheets in both trade and related subjects. Prereq or coreq: 4830.

4880-81-82 Seminar in Industrial Education (3, 3, 3) Educational innovations, current events, problems, and techniques associated with the field of industrial education.

4885 Organization and Development of Vocational-Industrial Clubs of America (VICA) (3) To give industrial education teacher experiences and understanding of organization and operation of VICA. Prereq: Undergraduate degree and 3 yrs teaching experience when taken for graduate credit.

4890-91-95 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.

5810-12-12 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.

5830-31-32 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 30 quarters hours of work selected from courses numbered 5000 and above are included in the M.S. requirement. Course selection shall be made according to the 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 this country.

DOCTORAL PROGRAM

The Doctor of Education and the Doctor of Philosophy degrees are available in Education, Physical 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 scores on the aptitude section of the Graduate Record Examination is required for all doctoral and specialist programs.

c. A superior grade point average.

d. Submission of satisfactory references relating to training, employment, and character.

e. 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 48.

Graduate Assistantships. A variety of graduate assistantships are offered in health education, physical 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/or 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 37996-2700.

Departments of Instruction

Division of Health and Safety

MAJORS

Health Education

Safety Education and Service

School Health Education

DEGREES

Ed.D., Ph.D.

M.S., Ed.S.

Associate Professors: J. Y. Miller, Dr. P. California (Los Angeles); M. A. Milliken (Emeritus), M. A. Yell; R. J. Purseby, Ph.D. Iowa; A. F. Thompson, Ph.D. Michigan State.


The Health and Safety Division offers the following degree programs:

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.

Safety

3520 Principles of General Safety (3) Deals with principles, practices, and procedures in general safety. Emphasizes individual identification and study of current problems in safety.


4410 Driver and Traffic Safety Education (5) Preparation and development of driver education in schools and colleges. Students are required to teach at least one non-driver. Valid driver's license required. 3 hrs and 2 labs.

4420 Advanced Driver and Traffic Safety Education (5) Development of competence in teaching of driver education through use of simulation, multimedia, and multiple-car driving range. Emphasis placed on teaching skills and supervision. Prereq: 4410. E

4430 Sports Safety (5) Accident prevention and injury control in sports activities; philosophy of sports safety; human environmental factors and interrelationship in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine to safety. 3 hrs and 2 labs. Su

4720 Workshop in Safety (3-5) Deals with special safety education problems. For advanced undergraduate students, graduate students, teachers, supervisors, and administrators. May be repeated. Su

5000 Thesis (1-15) P/NP only. 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

School Health

3000 Foundation of Health Science (3) Personal and contemporary health problems, i.e. mood modifying products, consumer health, international health, personal health practices, reciprocal relationships involving humankind, disease, and environment.

3210 First Aid and Emergency Care (4) Theory and practice, medical self-help. Leads to Red Cross Certification in Advanced First Aid and Emergency Care. (Candidate must be at least 18 years of age for certification.)

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 place of existing media and 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

3820 The Teaching of Sex Education (3) Trends, content, methods, and materials in sex education. F, W, Sp

3850 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. E

4120 Alcoholism and Alcohol Education (3) Emphasis on factors which make alcoholism serious health problem and safety problem. Instructional/educational and intervention programs.

4130 Suicide and Suicide Intervention (3) Emphasis on factors which make suicide a serious health problem. Instructional/educational and intervention programs.

4140 Death, Dying, and Bereavement (3) Theories of death and dying and other programs to mitigate trauma of death and dying.

4410 Consumer Health and Safety Education (3) Major consumer health and safety problems; selecting, purchasing, and financing of safety and medical services. (Same as Public Health 4410.)

4411 Instructor's Advanced First Aid and Emergency Care (3) Satisfactory completion qualifies one for American National Red Cross Certification as Advanced First Aid for Emergency Care Instructor. (Applicant must be at least 21 years of age for certification.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate.

5350 Civil and Defense Education (3) Civil and defense problems; tornadoes, fires, floods, mass civil disorders, and nuclear and personnel attack by alien countries.

5720-30-40 Graduate Workshop in Safety (3-6, 3-6, 3-6) Deals with specific safety problems. Special safety problems in a concentrated period of time. Su


5870-86-90 Current Issues in Safety Education (1, 1, 1) E

6010-20-30 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

5412 Cardiopulmonary Resuscitation (2) Theory and skills to implement basic cardiac life support following cardiac arrest due to heart attack, drowning, electrocution, suffocation, poisoning, drug intoxication, vehicular and other accidents. Educational and preventive aspects of controlling cardiovascular disease, W, Sp

4420 Drug Abuse Education (3) Problems and suspension of premises, phases of drug education and factors on society and methods of drug abuse education.

4430 Women's Health (3) Factors influencing women's health and women as consumers of nation's health service delivery systems.

4500-10-20 Field Practice in Health Education (3-6, 3-6, 3-6) Off-campus health education internship or field practice in educational or other agency with qualified professional.

4710 Workshop in School Health Education (3-6) For advanced students, teachers, school administrators, nurses and other paramedical school personnel. Lectures, demonstrations, films, field trips, and supervised research in special health problems. May be repeated. Su

5810-20-30 Problems in School Health Education (1, 1, 1) Individual identification and study of current problems in school health education. Extensive reading of literature.

5000 Thesis (1-15) P/NP only. E

5003 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 Problems and Practices in School Health (3) Comprehensive study and analysis of the principles, systems, and trends of and in school health. F

5020 Teaching of Sex Education and Human Sexuality (3) Analysis and explanation of theory, methods and materials for planning, organizing and teaching sex education and human sexuality in schools and other community settings. Sp

5510 Curriculum Construction in School Health Instruction (3) Analysis of school health instruction programs in elementary and secondary schools. Planning and construction of health curricula to meet needs, interests, and abilities of pupils. W

5520 Evaluation in School Health Instruction (3) Principles of objective tests; construction; place of behavioral and attitudinal scales; check list, questionnaires, surveys, and inventories in evaluation of health instruction. Includes criticism of several commercial prepared tests and construction and standardization of test. W

5530 School Health Program Surveys (3) Techniques and standards used in surveying total school health program; relative contribution of health instruction, health services, and healthful environment as each contributes to well being of individual students. Survey of existing school health program. Sp

5620 School Health Administration and Supervision (3) Analysis of various types of administrative control; budgetary problems; education-public health dilemma; responsibilities of school health personnel. Resource materials include case studies of on-going school health personnel. Resource materials include case studies of on-going school health programs. Sp

5630-40 Workshop in School Health Education (3, 3) Designed for graduate students, inservice teachers, and other health professionals. Emphasis in any workshop to be placed on one critical health issue. Sp

5720-30-40 Graduate Workshop in Health Education (3-6, 3-6, 3-6) Deals with specific health problems. Designed especially to explore special health problems in a concentrated period of time. Su

5810-20-30 Problems in School Health Education (1-3, 1-3, 1-3) Individual identification and study of W
current issues in school health education. Extensive reading and critical analysis of literature. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6030 Critical Analysis of Writing and Research in Health Education (3) F

6050-60 Seminar In Health Education (3, 3) W, Sp

6210 Health Aspects of Gerontology (3) Biolog- ical, psychological, and sociological aspects of aging related to health of individual. (Same as Public Health 8210.)

6220 Seminar on the Nation's Health (3) Compre- hensive overview of status of America's health. (Same as Public Health 8220.)

6230 International Health (3) Status of health in countries throughout world. (Same as Public Health 8230.)

Division of Physical Education

MAJOR DEGREES

Physical Education M.S., Ed.D. Ph.D.

Professors:
J. E. Acker, M.D. Tennessee; G. F. Brady (Emeritus); Ph.D. Iowa; B. D. Frank, Ph.D. Illinois; E. T. Hower, Ph. D. Wisconsin; A. J. Kozer, Ph.D. Michigan; N. E. Lay, Ph.D. Florida State; W. P. Lien, Ph.D. Iowa; M. Phillips, Ph.D. Iowa; H. B. Watten (Emeritus), Ph.D. Michigan; H. G. Welch, Ph.D. Florida.

Associate Professors:
P. A. Beutel, Ed.D. North Carolina (Greensboro); R. C. Crossley, M.F.A. Southern Methodist; R. E. Jones (Chairperson), Ph.D. Toledo; B. J. Mead, Ph.D. Purdue; W. J. Morgan, Ph.D. Minnesota; C. A. Winsberg, 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). Bachelor of Education degree in Physical Education with concentrations in exercise physiology, motor behavior, adapted physical education, and philosophical and sociological foundation.

The Doctor of Philosophy degree with a major in Education includes options and emphases as listed on page 48.

3000- and 4000-level courses require a different level of performance of those registered for graduate credit.

3420 Adaptive Physical Education Laboratory (1) Practical work, including student teaching, supplementing 4110. E

4005 Ballet Technique (2) Styles and vocabulary; emphasis on advanced practice and material. Prereq: 4000. Available to dance majors with consent of instructor. F, W

4020 Practicum In Dance Production (3) Prereq: Consent of instructor. W

4050 Rhythmic Analysis (3) Nature and principles of music, rhythm, and rhythmic notation with emphasis on correspondence with dance movement and composition. Prereq: Consent of instructor.

4060 Advanced Composition (4) Application of compositional, production, and administrative skills culminating in presentation of two complete choreographic works. Prereq: 3092, 4020. A

4070 Stagecraft for Dance Production (2) Equipment, design, properties, sets, and stage management.

4080 History of Dance I (3) Survey of dance of various societies and cultures from pre-history through nineteenth century.

4090 History of Dance II (3) Survey of development of dance in theatre, recreation, and education during twentieth century.

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) Relationship of measurement and evaluation to instruction in physical education. Advanced critical review of appropriate measures of physical fitness, sports skills and knowledge. W, Sp

4150 Creative Rhythms for Children (3) Methods, materials and techniques for grades 1-6. 3 hrs and 1 lab. F

4550 Methods of Teaching Dance (3) Principles and practical application in mini-teaching experience. Prereq: Upperclass or graduate standing and consent of instructor. W

4660 Movement Notation (3) Fundamentals with emphasis on notation and reading of elementary movement studies.

4880 Motor Behavior: A Theoretical Perspective (4) Examines motor behavior from information processing perspective and applies current research to support theoretical base. Prereq: Senior or graduate standing or consent of instructor. F

4890 Creative Rhythms for Children (3) Methods, materials, and techniques for grades 1-6. 3 hrs and 1 lab. F

5000 Thesis (1-15) P/NP only. 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 Administrative Problems in Health and Physical Education (3)

5120 Problems of the Curriculum in Physical Education (3)

5130 Methods in Physical Education (3) Characteristics of different types of measurement and data analysis of learning procedures in physical activities at these levels.

5140 Advanced Physiology of Sport (3) Critical examination of most rigorous and sophisticated essay pieces concerning metaphysical, epistemological, and axiological status of sport. Prereq: Consent of instructor. W

5150 Systematic Philosophic Analyses of Sport (3) Critical examination of most rigorous and sophisticated essay pieces concerning metaphysical, epistemological, and axiological status of sport. Prereq: 5140 or consent of instructor. W

5220 Readings in Physical Education (3) Comprehensive review of 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) Evaluation of appropriate 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 context. Prereq: 4880 or consent of instructor. W

5410-20-30 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: 3230 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. Sp

5550 Advanced Adapted Physical Education (3) Laws and regulations, theoretical bases for remediation or adaptation, programming implications. Prereq: 4110 or equivalent. W

5560 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.) Sp

5600 Applied Physiological (3) Principles of physiolo- gy 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 re-quirements 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 Phys- iology Laboratory (1) Laboratory techniques in experiments for students involved in fundamental movements, calisthenics, sports, and gymnastics. Prereq: Zoology 4940 or equivalent. Recommended: 1 yr chemistry, physics, and mathematics. 3 hrs and 1 lab. W

5650 or equivalent. 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

5900 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nutrition 5900, and Food Science 5910, and Social Work 5960.) P/NP only. E

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6010 Seminar in Physical Education (1) Research
topics in literature related to physical education. May be repeated with consent of instructor. S/NC only. E

6220 Independent Research (3) Selection of topic, development of procedure, and conduct of study 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) Electromyography laboratory and film analysis of sports skills. Prereq: 6010, 5590 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 Physiology (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

MAJOR DEGREE
Public Health M.P.H.


Associate Professors: C. B. Hamilton, Dr.P.H. Oklahoma; R. J. Puslsey, Ph.D. Indiana; G. Ellison, Ed.D. Tennessee; M. L. Peters (Chairperson), Ph.D. Illinois.

Lecturer: M. Duffy, M.D. Pennsylvania.

Master of Public Health degree with a major in Public Health. 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.

Public Health

3110 Communicable and Noncommunicable Disease (3) Modern concepts of diseases; ecology of common communicable and chronic disease problems including prevention and control. Prereq: 1 yr of biological science and 1 course in bacteriology. F, W, Sp

3320 Sanitation (3) History of sanitary awakening; disease-producing relationships and controls of water, sewage, refuse, milk, meat and other foods, air, insects, and soil; sanitation of homes, swimming pools, industrial plants, markets, restaurants, camps, and public bathing places. Healthful school living as affected by buildings and grounds, lighting, acoustics, thermal control, and safety provisions. Prereq: 1 yr biological science, 1 course in microbiology. 2 hrs and 1 lab. 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

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

4410 Consumer Health and Safety Education (3) (Same as School Health 4410).

4700-10 Field Practice in Public Health (3, 3) Field practice in public health under supervision of public health profession. Prereq: 6010, 5590 and Physics 2210 or equivalent. May be repeated with consent of instructor. S/NC only.

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 volunteers. Public health agency personnel emphasizes the problem-solution approach through email group interaction, case method, and critical incident technique. May be repeated. Su

4840-50-60 Problems in Public Health Education (1, 1, 1) Individual identification and study of current problems in public health education. Extensive reading of literature required. 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

5010-20-30 Workshop In Public Health (3-4, 3-6, 3-8) Designed to work with specific public health problems in short or extended period of time. S, W, Sp

5070-80-90 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 human life's survival, prevention of disease, performance and enjoyment. Lecture, demonstrations, laboratory, and field practice. Prereq: Consent of instructor. Su


5150 Industrial Toxicology (3) Elements 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. F, W, Sp

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. 3 hrs and 2 labs. W

5540 Factors in Problem Solving for Community Health (5) Test 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; research in conflict and cooperation; intervention and development. Laboratory to delineate a community near campus and to practice. 2 hrs and 4 labs. F

5560 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 learning levels. 1-2 hr lecture-seminar session 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, 3-5, 3-5) Theory and practice in selected areas. F, W, Sp

5730 Dental Health Education (3-5)

5735 Emergency Medical Services (3-5) Sp

5745 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

5795 The Training of Paramedical Personnel (3-5)


5900 Graduate Seminar in Public Health (1-2) Scope of public health as discipline and interdisciplinary to other academic and professional disciplines. Speakers both internal and external to UTK. Prereq: Baccalaureate degree in health-related field or consent of instructor. May be repeated. Maximum 6 hrs. (Same as Nursing 5900, Nutrition and Food Science 5910, Physical Education 5990, and Social Work S900.) S/NC only.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6210 Health Aspects of Gerontology (3) (Same as School Health 6210.)

6220 Seminar on the Nation's Health (3) (Same as School Health 6220.)

6230 International Health (3) (Same as School Health 6230.)

Division of Recreation

MAJOR DEGREE
Recreation M.S.

Professor: M. L. Peters (Chairperson), Ph.D. Illinois.

Assistant Professors: M. D. Blanton, Re.D. Indiana; K. L. Krick, Re.D. Indiana.

The Recreation Division offers the following degree programs:

- Bachelor of Science degree in Recreation (thesis and non-thesis programs) with concentrations in general recreation, recreation administration, and therapeutic recreation.

- Bachelor of Science degree in Recreation Education: Health Planning (3-5) Su

- Bachelor of Science degree in Recreation Administration (3) Introduction to recreation administration including planning, personnel, areas and facilities, program services, finances, and public relations. Prereq: 3140, 3200, 3860, or consent of instructor. F

- Bachelor of Science degree in Recreation Administration (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special services. Prereq: 3140, 3200, 3860, or consent of instructor. F

- Bachelor of Science degree in Recreation Administration (3) 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, 3860, or consent of instructor. F
4310 Camp Administration (3) Program planning and organization, personnel management, camp site development and maintenance, camp operation for administrators and supervisors. W

4500 Specialized Study in a Selected Area of Recreation (1-6) Comprehensive study in a selected specialized area within the broad field of recreation. For recreation students only. Prereq: Consent of instructor. May be repeated with consent of division. Maximum 6 hrs. E

5000 Thesis (1-15) P/NP only. 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

5130 Interpretations of Leisure (3) Concepts of leisure including social, psychological, cultural, and philosophical; recreative uses of leisure. Prereq: 3140 or consent of instructor. F

5140 Leisure Service Delivery Systems (3) Various systems—public, private, and commercial—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 ill and disabled realize their fullest potential. Prereq: Consent of instructor. W

5250 Implementation of Recreation Services for the Ill or Disabled (3) Policies and guidelines for organizing and implementing programs of 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. F, 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 Facilities (3) Management process as it pertains to operation of recreation facilities. F

5440 Problems and Projects In Recreation (1-6) Individual research on problem of special significance to student. Research projects of limited nature undertaken in lieu of thesis. May be repeated. Maximum 6 hrs. New problem must be undertaken for each repetition. E

5450 Specialized Study in Recreation (1-6) Advanced comprehensive study in selected specialized area within leisure and recreation field. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E
College of Engineering

R. E. C. Weaver, Dean
W. K. Stair, Associate Dean
W. A. Miller, Associate Dean
A. W. Spickard, Assistant Dean

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 VIDEO TAPE

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 videocassettes prepared from a regular classroom. The tapes contain a visual and audible record of a professor’s lecture and discussions with the on-campus classes and are replayed at remote locations. Telephone contact is established periodically between the professor and the off-campus class to allow full discussion and answer questions. Occasional visits by the professor are made to each remote class and students at off-campus centers and industrial sites.

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 round trip 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.

YEAR-IN-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 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.

Departments of Instruction

Chemical, Metallurgical and Polymer Engineering

MAJORS

Chemical Engineering
Metallurgical Engineering
Polymer Engineering

DEGREES

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

Professors:

H. C. Johnson (Head), D. Eng. Yale; D. C. Bogue, Ph.D. Delaware; B. S. Borie, Ph.D. Massachusetts Institute of Technology; C. A. Brooks, Ph.D. Tennessee; E. S. Clark, Ph.D. California (Berkeley); L. W. Crawford, Ph.D. Cincinnati; O. L. Culberson (Emeritus) Ph.D. Texas; J. F. Fellers, Ph.D. Akron; G. C. Frazier, Ph.D. Johns Hopkins; J. M. Holmes, Ph.D. Tennessee; H. W. Hsu, Ph.D. Wisconsin; S. H. Jury (Emeritus) Ph.D. Wisconsin; C. D. Lundin, Ph.D. Reinselater Polytechnic; O. J. Mackuage, Ph.D. Kentucky; C. F. Moore, Ph.D. Louisiana State; B. E. Oliver, Ph.D. Pennsylvania State; J. J. Perona, Ph.D. Northwestern; J. W. Prados, Ph.D. Tennessee; J. E. Spruief, Ph.D. Tennessee; E. E. Stansbury, Ph.D. Cincinnati; C. O. Thomas, Ph.D. Tennessee; R. A. Vandermeer, Ph.D. Illinois Institute of Technology; J. S. Watson, Ph.D. Tennessee; R. E. C. Weaver, Ph.D. Princeton; J. L. White, Ph.D. Delaware; M. A. Wright, Ph.D. Wales.

Associate Professors:

W. T. Becker, Ph.D. Illinois; D. B. Bruns, Ph.D. Houston; R. M. Counce, Ph.D. Tennessee.

Assistant Professor:

F. Weber, Ph.D. Minnesota.

Lecturers:


Graduate programs lead to the degrees of Master of Science and Doctor of Philosophy in Chemical Engineering with concentrations in chemical engineering, chemical bioengineering, advanced control systems, and polymer science and engineering, in Metallurgical Engineering, and in Polymer Engineering.
THE MASTER'S PROGRAM
Minimum departmental requirements include the satisfactory completion of:
1. A major consisting of 18 to 27 quarter hours of graduate courses in chemical engineering, metallurgical engineering, or polymer engineering. The polymer engineering major must include Polymer Engineering 5110, 5230, 5310, 5410, and 5120.2
2. One or two minors or collateral work, 9 to 18 hours total in engineering, chemistry, mathematics, physics, or other related fields.
4. Active participation in graduate seminars in the department. Resident students must register for the appropriate 5010 every quarter offered.
5. Final examination covering thesis, related fields, and graduate course work.

THE DOCTORAL PROGRAM
Students applying for entrance into the doctoral program must display concrete evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence.

Departmental requirements consist essentially of the satisfactory completion of:
1. Graduate courses in chemical engineering, metallurgical engineering, or polymer engineering amounting to approximately 36 quarter hours, at least 12 of which must be in 6000 series courses. The polymer engineering major must include Polymer Engineering 5110, 5210, 5230, 5310, 5410, 5120, and Chemistry 5140.
2. 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 chemistry, mathematics, physics, and engineering.
3. The comprehensive examination, usually given in two parts, and covering such material as chemical, mechanical, and polymer engineering operations and processes, thermodynamics, technology, mathematics, physics, chemistry, and other related fields.
4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 5010 every quarter offered.
5. 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, and Russian.

PROGRAM AREAS IN METALLURGICAL ENGINEERING
The metallurgical engineering program is flexible and interdisciplinary in nature. Students may be admitted from disciplines other than metallurgical engineering; these may include physics, mechanics, chemistry, chemical engineering, mechanical engineering and materials engineering. Prospective students should consult

metallurgical engineering faculty concerning development of individual special programs compatible with their backgrounds. Areas of specialization within the program may be physical metallurgy of structure-property relations, characterization of corrosion, welding metallurgy and materials joining, solidification, microscopy (electron and optical), chemical process metallurgy, failure analysis, mechanical behavior of materials and structure analysis.

UKT-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 joint program with the Chemistry Department having a chemical emphasis.

The specialization program in the department requires, for the M.S. degree, a thesis in the field. The completion of Polymer Engineering 4910, 5110, 5120, 5310, 5410, and either 5230 or 5210 plus active participation in the Polymer Seminar. The Ph.D. candidate must meet the above requirements, pass a special written examination in polymer science and engineering, and complete 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 5331 and 5140, plus active participation in the Polymer Seminar. Ph.D. students must also pass a special written examination as well as complete the above requirements.

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 2020, 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 exchanger condensation and boiling; radiation. Prereq: 3410. 3 hrs and 1 lab.
3440 Stagewise Operations (3) Analytical and graphical methods applied to stagewise separatory operations.
3450 Diffusional Operations (3) Diffusion, simultaneous heat and mass transfer, applications including humidification, gas absorption, extraction. Prereq: 3420, Chemical Engineering 3040.
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, transfer function. Chemical engineering. Theoretical 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, feed-forward control, controller tuning, 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 externalities; statistical properties of samples and source systems; empirical modeling of processes; statistical process control. Prereq: 3420 and Mathematics 3150.
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.
4420 Process Design and Economic Analysis (3) Development of basic information on a process into an integrated plant design considering mass and energy balances, product specifications, equipment characteristics, capital investment, operating costs and economic merit. Prereq: 4110, 4520.
4430 Special Problems in Design and Economics (3) Extension of 4420 for student participation in the American Institute of Chemical Engineering annual contest problem; other advanced design projects. Prereq: 4420.
4450 Hydrocarbon Processing (3) Study of specialized characterization of physical properties of fossil fuel raw materials and products, and of processes for conversion of fossil fuel raw materials into products needed in industrial energy, industrial raw material and consumer markets. Prereq: 3440.
4470 Sulfur Removal from Coal and Associated Problems (3) Chemical and physical properties of domestic coals, sulfur chemistry, sulfur transport in coal beds, and sulfur chemistry in both physical and chemical methods: fluidized bed combustion with both chemical 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.
4530 Chemical Engineering Reaction Kinetics (3) Chemical reaction rates in closed and flowing systems, interpretation of laboratory and pilot plant data; reactor design. Prereq: 3420, Chemistry 3430.
4620 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 and design, software for lookup table based control and non-linear control systems. Prereq: Chemical Engineering 3040.
4730 Mass and Energy Flow in Biological Systems (3) Basic physicochemical and organizational principles applicable to biological systems. Deriva-
ions of general equations of biomass 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 transport. Structure and rheology 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 concepts 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.

5000 Thesis (1-15) P/NP only. E

5100 Graduates Seminar (1) Prereq: Admission to graduate program. May be repeated. E

5050 Engineering Analysis (3) Analytical formulation of multifield and phase transport and chemical engineering problems involving deformation of solids, heat transfer and motion of fluids. (Same as Metallurgical Engineering 5050 and Polymer Engineering 5050.)

5120 Heat Convection (3) Analysis of heat convection in fluids under viscous and turbulent flow conditions, emphasizing analytical approach; simultaneous diffusion of momentum and heat. Prereq: 5050.

5130 Methods of Optimization (3) Principles and applications of various mathematical programming techniques for chemical engineering problems. Prereq: 5120.

5120 Process Dynamics (3) Analysis of recycle operations, steady state simulation and optimization of typical processes.


5310 Thermodynamics of Heterogeneous Equilibrium (3) Phase rule, equilibrium between phases; composition relationship between phases; ideal and nonideal solutions. Prereq: 3040.

5320 Statistical Thermodynamics (3) Basic concept of statistical mechanics and application to evaluation of thermophysical properties. Prereq: 5310.

5610 Chemical Reactor Design (3) Nonideal flow patterns in chemical reactors, diffusion and reaction in two phase systems; introduction to heterogeneous catalysis and reactor stability. Prereq: 4530.

5620 Differential Mass Transfer Operations (3) Equilibrium stage, concepts applied to mass transfer operations, emphasizing nonisothermal and multi-component systems.

6200 Mathematical Models in Chemical Engineering (3) Differential mass transfer operations: filling, plug-packed tower and bubble contacting devices; nonisothermal and multicomponent systems; current theories of mass transfer; mass heat and momentum transfer analyses. 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) P/NP only. E

6130 Process Optimization (3) Optimization of chemical process equipment and systems by various techniques; static and dynamic systems. Prereq: 5110.

6210 Advanced Diffusional Operations (3) Fixed and fluidized beds, stagewise and differential mass transfer bed concepts. Prereq: Consent of instructor.

6250 Venture Analysis in the Process Industries (3) Interactions among laws of typical chemical company in application of modern decision theory and mathematical models to achieve optimum production investment and decision in face of external competition. Prereq: 5250.

6310 Thermodynamics of Irreversible Processes (3) Thermodynamic treatment of irreversible chemical processes, transport processes, coupling phenomena, with special emphasis on the methods of interest to engineering and bioengineering students. Prereq: 5310.


6420 Stability Phenomena in Chemical Engineering: Continuous Systems (3) Instabilities and instabilities in fluids based upon interaction of fluid dynamic phenomena with heat transfer, diffusion and chemical reactions. Emphasis on formulation of problems and methods of solution. Stability of jets and formation of emulsions; Benard instability, Marangoni turbulence. Prereq: 5810 or 5620 or equivalent.

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.

6520 Catalytic Reactor Design (3) Principles of kinetics and reactor design; emphasis on design and analysis of heterogeneous catalytic reactors. Prereq: 6510.

6710 Process Dynamics (3) Development of dynamic models for chemical processes and the laws, time scales, modeling of systems by frequency, step, and pulse response methods. Prereq: Consent of instructor.

6900 Advanced Topics of Current Interest to Chemical Engineers. May be repeated. Maximum 9 hrs.

6920 Engineering Materials I (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; control of corrosion and mechanical performance. Suggested for electrical engineering students.

6930 Engineering Materials II (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; control of corrosion and mechanical performance. Suggested for electrical engineering students.

6940 Engineering Materials IV (3) Extension of 2110 or 3110 with emphasis on materials processing for the design and evaluation. Suggested for mechanical and industrial engineering students.

6950 Engineering Materials V (3) Extension of 3110 with emphasis on the mechanisms and control of reactions of engineering materials with aqueous, nonaqueous, and gaseous environment. Prereq: 3110 or equivalent.

6960 Engineering Materials VI (3) Extension of 2110 or 3110 with emphasis on materials of significance in nuclear engineering; nuclear reactor construction materials, nuclear fuel materials, and interaction of radiation with solids to produce changes in engineering properties. Suggested for nuclear and mechanical engineers.


3220 Diffusion and Annealing (3) Introduction to solid state kinetics; point defects, solid solutions, diffusion mechanisms and effects of cold worked structures. Prereq: 3210: Mathematics 2840.

3310 Biomedical Applications of Materials for Life Scientists (3) Principles 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.

3710 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of mechanical/thermal processing for finished and semifinished articles; casting, powder metallurgy, plastic forming, joining, heat treatment. Prereq: 2110 or equivalent.

4240 Engineering Materials Design (3) Property control through processing and treatment and transformation in ferrous alloys. Plain carbon steels, alloy steels, and tool steel processing for property selection and design requirements. Prereq: 3220 or consent of instructor.

4250 Design and Analysis (3) Design and laboratory sessions on analysis of materials, requirements and performance in engineering structures and components. Prereq: Senior standing.

4510 X-Ray Diffraction and Its Application (4) Basic principles and application of x-ray diffraction from materials. Theory, powder technique, precision lattice constants, chemical, analysis and phase identification, preferred orientation. 3 hrs and 1 lab.

4540 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 4540.)

4580 Fracture-Safe Design (3) (Same as Engineering Science and Mechanics 4540.)

4730 Mechanical Metallurgy I (4) Elastic behavior; description of stress, strain, and stress-strain relation; strains and strain loading; failure by yielding; stress concentration and notch sensitivity; ductile fracture; brittle fracture due to geometry and rate of loading. Prereq: First course in Materials Science and Engineering Science and Mechanics 3511. Also suggested for mechanical engineering and materials science students.

4740 Mechanical Metallurgy II (4) Brittle fracture due to mechanical and environmental factors; fatigue, residual stresses; creep and stress rupture: effect of microstructure; brittle plastic strain and
plastic stress-strain relations; fabrication by forging, rolling, drawing, and annealing. Prereq: 4730 or Mechanical Engineering 3650 and first course in Materials Science, or consent of instructor. Suitable for advanced polymer engineering science and mechanical engineering students.

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.

5000 Thesis (1-15) P/NP only. E

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. E

5050 Engineering Analysis (3) (Same as Chemical Engineering 5050.)

5110 Dislocations (3) Theoretical and experimental analysis of line defects and their interactions 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 orientations and annealing. Prereq: 5120.

5140 Diffusion in Solids (3) Analysis of models and experimental observations to relate phenomena and mechanistic description of diffusion and annealing of point defects.


5210-20-30 Welding Metallurgy (3, 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 discussed. Not for credit for Polymer Engineering majors.

5290 Polymer Processing (3) Rheological properties of polymer melts and solutions, viscometry, unit operations of fiber, plastics and rubber industries: dimensional analysis and scale-up, flow through dies and pipelines, screw extrusion, spinning of fibers, injection molding. Not for credit for Polymer Engineering majors.

5310 Solidification and Crystal Growth (3) Solute redistribution, thermodynamic considerations, kinetics, convection and fluid flow effects on the solid to liquid transition. Prereq: Mathematics 4550.

5340-50 Electron Microscopy I and II (3, 3) Kinetically driven theories of image formation are developed and their application to electron diffraction patterns and contrast effect in transmission electron microscopy is discussed. Special attention is given to metallurgical applications such as plastic deformation, fracture, precipitation, and phase transformations. Prereq: 4510-20.

5560 X-Ray Metallography (3) Application of x-ray diffraction theory and techniques to metallic systems. Powder and single crystal techniques; reciprocal lattice; analysis of scattered intensity; line profiles; orientation of single crystals; preferred orientation; phase analysis; order-disorder transformations.

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.

5840-50 Metallurgy of Deformation and Fracture (3, 3) Theoretical and engineering analysis of effects of stress state, strain rate, environment, temperature, and metallurgical structure on mechanical behavior in service, testing, and fabrication.

5900 Special Topics in Metallurgical Engineering (3) Recent advances in metallurgical engineering and related fields: fiber composites, ordered alloys, grain boundaries and radiation effects. May be repeated. Maximum 9 hrs.

5910-20-30 Metallurgical Thermodynamics (3, 3, 3) Application of thermodynamics and physicochemical methods to metals and metallurgical reactions. Relation of theory and experiment to structure of liquid and solid solutions, and to alloy systems.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110-20-30 Theoretical Metallurgy (3, 3, 3) Phases of solid state physics applicable to metallurgy: elasticity, introductory quantum theory, specific heats, electron energy level and thermal conductivity, magnetic properties, theory of alloy formation. Prereq: 4610 or Physics 3720; Mathematics 4550 and consent of instructor.

6160-70 Phase Transformations II and III (3, 3) Continuation of 5150 with emphasis on more advanced theoretical formulations of nucleation and growth theories in solid polymers and related to martensitic transformations and shape memory phenomenon. Prereq: 5150.


6410-20 Thermodynamics of Solids (3, 3) Classical and statistical thermodynamic analysis of stability of solid solutions, compounds and ordered phases. Prereq: 5910-20-30 or consent of instructor.

6510-20 Advanced X-Ray Diffraction (3, 3) Generalized theory; crystal structure determination; thermal motion; lattice faults, diffuse scattering. Prereq: 5560.

6600 Special Topics in Metallurgical Engineering (3) Developments in the science and technology of metals and alloys. May be repeated. Maximum 9 hrs.

Polymer Engineering


4920 Polymer Processing (3) Rheological properties of polymer melts and solutions, viscometry, unit operations of fiber, plastics and rubber industries: dimensional analysis 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 Fiber and Textile Engineering (3) Chemical and crystalline structure of important fibers, polymer melt processing, mechanical behavior of polymers. Prereq: 5410 or consent of instructor.

5000 Thesis (1-15) P/NP only. E

5010 Graduate Seminar (1) Prereq: Admission to graduate program. May be repeated. E

5050 Engineering Analysis (3) (Same as Chemical Engineering 5050.)

5110 Structural Characterization of Polymers with Electromagnetic Radiation (3) Theory of scattering and diffraction of electromagnetic waves by matter, special application to experimental techniques applied to 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.


5310 Polymer Solution Properties and Characterization (3) Molecular weight determination, chromato- graphic analysis, 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 shear, extensional flow, convective relationships, viscous heat generation; application to processing particularly extrusion, injection molding, film production.

5450 Principles of Injection and Blow Molding (3) Principles of injection molding, structure of molded parts; principles of structural foam and sandwich molding; principles of blow molding. Application to structure and properties of blow molded containers. Prereq: 5410 or equivalent.

5511 Laboratory Methods in Polymer Engineer- ing I (1) Basic experimental procedures for polymer characterization, x-ray diffraction and optical methods. Coreq: 5110 or consent of instructor. 2 labs.

5515 Laboratory Methods in Polymer Engineer- ing II (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) Methods for measuring the physical properties of copolymers plus structures of two phase block polymers and polymer mixtures as related to glassy and crystalline transitions, phase incompatibility, thermal-mechanical, and optical properties.

5910-20-30 Metallurgical Thermodynamics (3, 3, 3) Application of thermodynamics and physicochemical methods to metals and metallurgical reactions. Relation of theory and experiment to structure of liquid and solid solutions, and to alloy systems.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110 Optical Properties of Polymers (3) Maxwell's
equations and electromagnetic theory of light, optical properties, spectroscopic and spectrophotometric data, including theory of birefringence, applications to spherical structures and fibers studies of Stein, light scattering from polymer systems.

6150 Advanced Diffraction Methods for Characterization of Macromolecules (3) Classical methods of crystal structure determination; Patterson function for crystals, crystallographic nets and Bessel function techniques; levels of order, thermal motions, defects, order-disorder transitions and para-crystallinity. Precision and technology photography, single crystal and powder X-ray 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, differentiation of constitutive equations of viscoelastic materials.

6220 Advanced Methods of Polymer Processing (3) Application of theories of rheological properties and structures formation to analysis of polymer process operations. Prereq: 5210.

6230 Advanced Mechanical Behavior of Polymers (3) Stress analysis with emphasis on developing constitutive equations relating behavior of solid polymers, failure analysis and general deformation mechanics of solid polymers. Relation of microscopic properties to molecular structure.

6250 Large Deformation Elasticity (3) Curvi-linear tensor analysis, theory of finite strains, Mooney-Rivlin formulation of isotropic non-linear elastic deformation of large homogeneous and non-homogeneous deformation problems, application to vulcanized rubber, reinforcement with inextensible cords. Prereq: 5250 or equivalent.


6610 Advanced Industrial Polymer Chemistry (3) Chemistry and properties of new polymeric engineering materials: highly integrated engineering and chemical approach. Prereq: Consent of instructor.

6910-20-30 Recent Advances in Polymer Science and Engineering (3, 3, 3) Treatment of latest developments in polymer science and engineering with concentrations in water quality, water resources, and air quality.

MASTER OF SCIENCE PROGRAM

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

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

CIVIL ENGINEERING

The Department of Civil 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-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 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

MAJORS

Civil Engineering

Environmental Engineering

Emersmtt Professor: C. R. Walker, S.M Massachusetts Institute of Technology, P.E.


Assistant Professors: E. S. Hougland, Ph.D., Virginia Polytechnic Institute; R. B. Robinson, Ph.D., Iowa State, P.E.


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

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Option I or II must be approved by 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


4240 Structural Design (3) Plate girders, composite steel and concrete beams, connections and details, and design of small industrial buildings. Prereq: 3250 and 4410. 23-3 hour periods. W, Sp

4260 Photogrammetry (3) Methods of plotting maps from aerial photographic input; applications. Prereq: 2350. Forestry Summer Camp for forestry majors. F

4340 Analysis of Framed Structures (3) Maximum stresses due to moving loads; uses of influence lines; lateral forces due to earthquake and wind;
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 conditions, and properties of matrices. Prereq: 5170 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; elastoplastic behavior considered for structural transmission; non-linear 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: 5150, and Engineering Science and Mechanics 5180. (Same as Engineering Science and Mechanics 5180) Sp, A

5220 Pavement Design (3)
Pavement loads; pavement design; practices; construction and maintenance. Prereq: 5310. Sp

5240 Advanced Properties of Materials: Cement and Concrete (3)
Microporous structure 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 maintenance techniques; 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 elements and between transportation and other community features. (Same as Planning 5270) W

5310 Engineering Practice (3)
Valuation and feasibility studies; 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: 4320 or consent of instructor. Sp

5420 Structural Model Analysis (3) Theoretical methods of analysis. Prereq: 5420. W

5430-40 Construction Management I, II, III (3, 3, 3) Management and organization of heavy and building construction projects. Prereq: 4440 or consent of instructor. W, Sp

5470-70 Construction Estimating I, II, III (3, 3) Project costs, estimating techniques; market cost conditions and feasibility of design as it applies to costs. Prereq: 4430 or consent of instructor. W, Sp

5550 Slope Stability and Retaining Structures (3) Slope stability; analysis of cut slopes and embankments; lateral earth pressure theories. Design of rigid retaining structures, pile walls and anchored bulkheads. Coreq: 4220

5560 Shear Strength and Stress Behavior of Soil (3) Shear strength of fine grain soil from perspective of idealized, simple clay. Drained and undrained shear strength behavior of real soils. Consolidation theory. Coreq: 4220

5570 Soil Mechanics—Seepage (3) Saturated flow through embankments, foundation, and embankment failures. Prereq: 3310 or consent of instructor. Sp

5610 Behavior of Steel Structures (3) Behavior of structural steel members under fatigue loading; relation between research results and current specialization for design. Prereq: 3230. W

5730 Prestressed Concrete (3) Properties of prestressing materials and anchorage systems; methods of pretensioning 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

5800 Urban Systems: Engineering and Management I (3) Management and various 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 municipal public works. Prereq: Graduate standing in 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 public works; recreational facilities and areas; transit, cleaning and snow removal, water supply and waste water drainage, solid waste, air pollution and regulations. Prereq: 5800. Sp

5810 Traffic Engineering—Characteristics (3) Driver-vehicle-roadway system; level-of-service concept of capacity. Coreq: Statistics 3450. 2 hrs and 1 1/2 hr lab. F

5820 Traffic Engineering—Operations (3) Fixed-time and variable-time control systems; progressive systems; one-way operations; reversible flows; system operation, including computerized networks; legal aspects of operational controls. Prereq: 5810. 2 hrs and 1 1/2 hr lab. W

5840 Geometric Design (3) Advanced theory and practice in the geometric design of highways. Prereq: 4600. Sp

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, safety, utility considerations, parking, effect of mass transportation; channelization; marketing; lighting; freeway, frontage road, surface street systems. Prereq: Consent of instructor. F

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) Route design by bus, rapid rail and taxicab transit. Nature of public transit; its various roles and how they fit community's need; user preferences; modal split models; total social, political, economic and technical impacts of public transit. Prereq: 4600 or graduate standing. W, A

5880 Highway Safety I (3) Transportation safety, highway safety, Legislation, federal-state-local relationships, utility considerations, current safety standards. Prereq: Graduate standing or consent of instructor.

5885 Highway Safety II (3) Effect of current tort law upon highway safety activities; roadway safety design; cross-sections, barriers, guardrails and energy attenuators; identification and correction of high accident locations and system deficiencies. Prereq: 5880 and graduate standing.

5890 Traffic Accident Reconstruction (3) Proper traffic accident data collection and analysis as basis of designing accident prevention or control programs. Many contributing factors to an accident; proximate and secondary accident causes as they relate to roadway improvements. Prereq: 4640 or 5810 or consent of instructor. Sp, A
5900 Special Problems in Civil Engineering (1-8) To fulfill the special problem requirement in the non-thesis program. Enrollment limited to civil engineering students in non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. NC: 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) P/NP

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 program projects. Long range and day-to-day management requirements. Prereq: 6110.

6160 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 5510. Sp, A

6740 Behavior of Reinforced Concrete Beams and Slabs (3) Strength and behavior of statically indeterminate reinforced concrete structures; applicability of elastic analysis to framed structures. Prereq: 5740 and 5740. Sp, A

6750 Behavior of Reinforced Concrete Slabs (3) Behavior, analysis and design of reinforced concrete slabs; finite element solutions. AC Code methods; yield theory. Prereq: 5160 or Engineering Science and Mechanics 6310. Sp, A

6830 Traffic Flow Theory (3) Queuing theory, Markov processes, Monte Carlo methods, simulations of various conditions and/or designs. Prereq: 4549 or Mathematics 3150 or Mathematics 5270.

6860 Statewide Passenger Transportation Planning (3) Comprehensive multimodal transportation plan, intercity traffic models, functional classification, programming and scheduling. Emphasis on government policy 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 process and possible research designs. Prereq: 5860. W, A


6890 Planning Models for Transportation Systems II (3) Analytical models 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: 6860. 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

4000 Environmental Protection (3) Managing of waste, pollutants, hazardous materials, and hazardous waste. Aspects of environmental, solid wastes, commercial insects and rodents, food, and excretion of physical energy to promote health, and to promote efficiency and comfort, and to safeguard balances in natural ecosystems. Principles of environmental protection; objectives of design and practice without detailing design of practice methods.

4030 Environmental Engineering Chemistry (3) Fundamentals of chemical processes, generation, formation analysis, and removal of environmental contaminants. Prereq: Chemistry 1130 and senior standing.

4160 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policies; formulation of system constraints and analysis of design alternatives; 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. Dams, safety control, environmental impact of reservoir projects. Prereq: 3330 or consent of instructor.

4220 Water Resources Engineering Development (3) Multispective evaluation procedures for comparing and selecting among water resources development alternatives; achieving project optimality; single- and multi-purpose projects; special topics in new developments in water resources engineering. Prereq: 3330 or consent of instructor. W

4150 Water and Urban Welfare (3) Social, economic, and political aspects of water and urban welfare. Impact of reservoir projects. Prereq: 3330 or consent of instructor. Sp

4250 Elements of Water and Wastewater Treatment Systems Designs (3) Introduction to unit operations and processes employed in physical, chemical, and biological treatment of water and wastewater. Application of unit operations and processes in design of water and wastewater treatment plants. Prereq: 3320 and 3330. F, W

4520 Elements of Water and Wastewater Treatment Systems Designs (3) Analysis of relationship among emission sources, meteorology and topographic factors, and adverse effects on receptors; engineering approaches for air pollution control. Prereq: 4529. 2 hrs and 1 lab. W

4600 Solid and Hazardous Waste Management (3) Magnitude and characteristics of solid and hazardous waste systems; disposal systems including landfill, incineration, composting, fixation, resource recovery, and proposed new technologies; current and future regulations. Prereq: Junior standing. Sp

4700 Air Pollution—Air Resources Management (3) Theory of physical, chemical, and biological processes important in subsurface hydrology. Hydrodynamic dispersion, anisotropy, layered soils, and unsaturated flow phenomena. Analytical solutions of flow equations. Dupuit approximation, analog and numerical methods, Hele-Shaw, and graphical solutions. Prereq: Engineering Science and Mechanics 3110 or consent of instructor. W

5330 Descriptive Hydrology (3) Occurrence and description of elements of hydrologic cycle, effects on man and relation to manm. Not for civil engineering majors.

5400 Introduction to Environmental Systems (3) Models of air and water quality, water resources, solid waste disposal, and hazardous waste. Exposure to current literature on environmental management problems; optimization of these systems. Prereq: Graduate standing. Civil Engineering 4800 or consent of instructor. Sp

5501 Water and Wastewater Treatment Theory I (3) Theory of unit operations employed in sanitary engineering. Prereq: 4529. F

5502 Water and Wastewater Treatment Theory II (3) Theory of chemical, physical, and biological processes employed in water and wastewater treatment. Prereq: 4529 or consent of instructor.

5530 Environmental Engineering and Natural Systems Behavior (3) Seminar in selected issues of environmental engineering science relating to natural system behavior. Eutrophication, trace metals and trace organics. Prereq: Graduate standing or consent of instructor.

5551 Water Quality Management (3) Water quality control objectives, methods, and philosophies; water quality criteria; effect of various uses on water quality; receiving water characteristics and waste assimilation capacity; regulatory standards; economic considerations. Prereq: 4520. W

5582 Microbiology for Sanitary Engineers (3) Microorganisms and microbiological processes significant in sanitary engineering, including basic microbiology, detection and identification, enzymes, metabolic 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 typical methods, principally instrumental, to analysis of environmental pollutants. Prereq. 4530. 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. 4600, 5592, 5503. 1 lab.

5700 Planning and Air Pollution Control (3) Relation between air pollution, area development, and economic growth. Social, economic, and political processes involved in air pollution control.

5710 Air Pollution Control Engineering (3) Emission control systems for industrial and power generating processes, stack sampling methods, air testing, dispersion of pollutants. Prereq: Graduate standing. F

5715 Ambient Air Monitoring (3) Physical and chemical techniques for ambient air monitoring. Survey of the Federal quality control of ambient air monitoring data. Use of monitoring data in air quality management programs. Prereq: Consent of instructor.

5720 Air Pollution Particle Collection Theory (3) Model behavior of particles suspended in gaseous medium including particle motion, coagulation, and aerodynamic capture of particles. Prereq: Engineering Science and Mechanics 3110. W

5725 Air Quality Modeling and Impact Assessment (3) Techniques to assess the air quality impact of major transportation projects and industrial air pollution sources. Application of atmospheric dispersion models and evaluation of meteorological and air quality data. Prereq: Graduate standing. Computer Science 3150. Sp

5730 Air Pollution Control Device Design (3) Design and evaluation of systems used to control emission 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 pollutants emissions from industrial processes. Prereq: Graduate standing. 2 hrs and 1 lab. Su

5745 Ambient Air Chemistry (3) Reaction mechanisms for gas-phase reaction, and use of advanced secondary air pollutants from anthropogenic primary pollutants 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, relation between Eulerian and Lagrangian approaches to problem between instantaneous and continuous sources, diffusion in a zone of wind shear and diffusion from urban area sources. Prereq. 5725, 5800.

5900 Special Problems in Environmental Engineering (1-6) To fulfill the specific problem requirement in the non-thesis program. Enrollment limited to environmental engineering graduate students not included in other courses. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/N Only. E

5990 Environmental Engineering Seminar (1) All phases of environmental engineering including reports on current research at The University of Tennessee, Knoxville. Course credit not applicable to graduate degree program. Prereq: Active graduate standing in environmental engineering. May be repeated. S/N Only. E, W, Sp

6110-20 Advanced Topics in Fluid Mechanics and Convective Transfer (3, 3) (Same as Engineering Science and Mechanics 6110-20.)

6230 Kinematic Wave Theory (3) Approximations of DeSaint Venet equations, kinematic wave theory applied to overland flow and streamflow. Criteria for approximation and methods of linkage of infiltration, overland flow and streamflow. Prereq. 5230 or equivalent. Sp, A

6510 Industrial Waste Unit Operations and Processes (3) Laboratory and pilot plant development of physical, chemical and biological variables for treatment of industrial wastes and residuals, utilization of variables in design. Prereq: 5501, 5502, 5503, 5505. 1 hr and 4 labs.

6520 Industrial Waste Management (3) Sources and characterization of industrial wastes, recycling, waste reduction, energy recovery, resource recovery, and treatment options, ultimate disposal of residuals including thermal processes, land application, recovery, and encapsulation; design oriented. Field trips. Prereq. 5501, 5503 or consent of instructor.

6530 Rate Processes in Environmental Pollution (3) Application of scientific principles concerning movement and fate of chemicals at interfaces of three geospheres of environment (air, water and earth solid). Development of intuitive sense to enhance problem solving. Prereq. 5601, 5503 or consent of instructor.


6910-20 Special Topics in Environmental Engineering (3, 3) Advanced selected problems of current interest in environmental engineering. Prereq: Consent of instructor. E

NOTE: Prerequisite to all graduate courses: Consent of instructor.

**Electrical Engineering**

**MAJOR**

**Electrical Engineering**

**DEGREES**

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

**Professors:**

J. M. Googe (Head), Ph.D. Georgia Institute of Technology, Ph.D. Harvard University; J. M. Bailey, Ph.D. Georgia Institute of Technology; A. O. Blackman, Ph.D. University of California, W. R. Emling, Ph.D. University of Tennessee; R. E. Bodenheimer, Ph.D. Northwestern; R. C. Gonzalez, Ph.D. Clemson; J. F. Pierce, Ph.D. Tennessee; J. H. Weaver, Ph.D. Wisconsin, E.P.

**Associate Professors:**


**Assistant Professors:**

J. D. Birdwell, Ph.D. Massachusetts Institute of Technology; J. S. Lawler, Ph.D. Michigan State.

**Masters 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.

**Doctoral Program**

A graduate program leading to the Master of Engineering degree is available to qualified graduates of the Master's degree. Graduate curriculum in electrical engineering or its equivalent.

A minimum of one-third of the program must be in engineering design, and one-third in one of, or a combination of, advanced mathematics, computer sciences, basic sciences, or engineering sciences.

**Degree Requirements**

Specific degree requirements which must be met include:

1. Electrical Engineering 5700-80 and 5710. Electrical Engineering 5710 is normally available in both fall and spring quarters.

Students electing courses such as 5650-60, 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 4250, or 4510-20-30. Other approved 4000-5000 level mathematics courses must be submitted for any of 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 coursework.

**Doctoral Program**

The Ph.D. degree with a major in Electrical Engineering may be pursued in the areas of circuit theory, computers, electro-optics, communication theory, electromagnetic field theory, and computer engineering.
theory, plasma engineering, power systems, solid-state electronics, and control systems. Selection of 30 hours of graduate courses for the Ph.D. degree include the following:

1. A Master of Science or Master of Engineering degree.
2. A minimum of 72 quarter hours of course work beyond the B.S. degree excluding thesis, research, and dissertation credit.
3. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 6000 level.
4. 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.
5. A minimum of 36 quarter hours credit in doctoral dissertation.
6. 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.
7. Satisfactory performance on both a qualifying and comprehensive examination.

The qualifying examination is prepared by the electrical engineering faculty and consists of a 3-hour written examination in each of four areas. Areas (1) mathematics and transform methods, and (2) basic passive and active networks are required of all Ph.D. students. An additional 9 hours are chosen from two of the 12 graduate course divisions in the department and cover material from undergraduate courses and first year graduate courses. A student who fails the qualifying examination must take and pass the examination the next time it is offered to remain in the Ph.D. program. The qualifying examination is normally taken after the completion of 9 quarter hours of course work or immediately after completion of a Master's degree. A minimum of 27 hours of graduate course work must be completed before the student has taken the qualifying examination.

The comprehensive examination is prepared by the student's doctoral committee and consists of a 3-hour written examination in the student's major area, a 2-hour written examination in a related area, and an oral examination. The comprehensive examination is normally taken at least six months after passing the qualifying examination. Part of the comprehensive oral examination will be a defense of a written dissertation proposal. The comprehensive examination must be passed and the dissertation proposal accepted by the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D. degree.

Participation in departmental seminars. Many of the electrical engineering courses are offered in the evening. Engineering work opportunities are encouraged and are utilized 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.


3050 Basic Field Theory (3) Forces between charges, electric and magnetic fields. Gauss's law and divergence, potential and line integrals, material bodies, polarization, magnetic circuits, Maxwell's equations, dynamic potentials. Prereq: Mathematics 2850.

3060 Propagation I (3) Propagation of waves in transmission lines and in other guiding systems. Impedance and reflection coefficient of waves, standing wave and traveling wave measurements. Introductions to interference phenomena, transmission line filtering, microwave circuit construction, graphical and computer methods. Prereq: 3050. 3 hrs including bidweel lab.


3110 Basic Electrical Engineering-Circuits and Fields (3) For non-electrical engineering majors. Prereq: Mathematics 2850, Physics 2310-30. 3 hrs including bidweel lab.

3120 Basic Electrical Engineering-Electronics (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including bidweel lab.

3130 Basic Electrical Engineering-Machinery (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including bidweel lab.

3160 Logic Design of Digital Systems (3) Introduction 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 microcomputer architecture and system components to include basic structure and function of arithmetic, storage, input-output, and control systems. Instruction set capabilities and machine language programming. Prereq: 3050 and Computer Science 3150, 3150 or 2710. 3 hrs including bidweel lab.

3190 Plasma I (3) Engineering applications of plasma physics, plasma effects and devices. Topics include plasma production, use of plasma light sources, laser operation and applications (electro-optics), and MHD, controlled thermonuclear and other techniques of plasma production. Prereq: Physics 2310-20-30. 3 hrs including bidweel lab.

3720 Linear Systems Analysis (3) Steady-state and transient response, log-frequency, gain-phase, and polar plots; block diagram transformation; signal flow graphs; analogues systems, properties of second order systems; introduction to feedback theory; stability criteria. Prereq: 3150, 3190. 3 hrs including occasional labs.

3810 Basic Electronics I (3) Band theory fundamentals; theory and applications of p-n junctions; simple potential and field-effect transistors and applications in simple circuits. Coreq: 2030. 3 hrs including project laboratory.

3820 Basic Electronics II (3) Physical operation of bipolar transistors and applications with feedback. Basic waveform integrations in amplifiers. Integrated circuit fundamentals. Prereq: 3810. 3 hrs including project laboratory.

3830 Basic Electronics III (3) Frequency and transient response of open-loop transistor amplifiers. Fundamentals of integrated-circuit operational amplifiers and applications in basic feedback configurations. Basic digital switching circuits. Prereq: 3820. 3 hrs including project laboratory.

4020 Direct Energy Conversion (3) Background physics; conversion devices including photovoltaic solar sources, thermoelectric generation, and fuel cells; related aspects of d.c.-a.c. inverter and energy storage. Prereq: 3820, 3900.

4080 Microwave Circuits and Electronics (3) Scattered wave description of circuits, including isolators and amplifiers, couplers and power dividers, circulators, switches, and multiplexers. Microwave switching, filtering and multi-plexing. Prereq: 3060. 3 hrs including bidweel lab.

4090 Propagation II (3) Metal tube, dielectric rod, and stripline waveguides. Waveguide resonators and other loading components. Design of structures utilized for microwave power transmission and for microwave integrated circuits. Prereq: 3060. 4 labs.


4370 Introduction to Feedback System Design (3) Mathematical formulation of control systems; steady state error and error constants; root-locus method; optimum gain adjustments; compensation networks; introduction to compensation. Prereq: 3720. Lab optional.

4410 Power System Components and Control (3) Modeling of transmission lines and cables; Power calculations and power flow limitations. Control of real and reactive power flows in interconnected power systems; the PF and QV control problems. Prereq: 3090.


4430 Transmission, Distribution, and Protection (3) Studies in underground and d.c. transmission; consideration of over-voltages and insulation requirements; system protection against faults. Prereq: 3090, 3090.

4460 Lasers and Masers (3) Introduction of principles of laser and maser action and optical concepts and electrical engineering analogies. Consideration of practical devices and applications.

4470 Plasma II (3) Magnetohydrodynamics. Prereq: 3190.

5000 Analog-Digital Systems (3) Principles of analog-to-digital and digital-to-analog conversion; application of these principles to signal processing. Active filters, amplifiers, and other integrated circuits in signal processing. Theory and design of feedback amplifiers and sample-and-hold circuits. Prereq: 3090.

4750 Electro-Acoustics (3) Wave equation for sound, radiation from pistons, impedance of a piston, loudspeakers, horns, speaker systems, phonograph recording, microphones, and the recording and reproduction of noise. Prereq: Senior standing.

4800 Analog Signal Processing Circuits for Electronic Instrumentation (3) Operational amplifiers, instrumentation amplifiers, and other integrated circuits in signal processing. Active filters, amplifiers, attenuators, function generators, active rectifiers, and other applications. Analysis of interfacing problems between transducers and signal processors. Prereq: 3630. 3 hrs including project laboratory.

4810 Discrete-Data Systems (3) Introduction to analysis and design of digital data control systems using frequency domain techniques. Real-time digital data transmission and control of digital computers in closed-loop feedback systems. Prereq: 3720.

4820 Introduction to Pattern Recognition (3) Role of pattern recognition within framework of artificial intelligence. Topics dealing with learning and adaptive machines. Typical applications of pattern recognition to problems of practical significance. Problem-oriented approach to pattern recognition problems. Prereq: Either 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4820.)

4830 Digital Image Processing (3) Principal methodologies for processing different types of images, both real and synthetic, by means of digital computers. Computational algorithms for image operations. Prereq: 3100 and Computer Science 3150, or Statistics 3450 and Computer Science 1510. (Same as Computer Science 4830.)

4850 Small Computer Systems (3) Basic structure of small computer systems, input-output techniques, software and hardware integration methods. Computer and systems language programming. Course is project-oriented. Prereq: Basic Engineering 1410, Computer Science 1510 or 3150 or consent of instructor. (Same as Computer Science 4850.)

4910-20 Special Electrical Engineering Problems (3) Problems in electrical engineering involving library and experimental research.

5000 Thesis (1-15) P/NP only. E

5040-50-60 Electrical Engineering Research (3, 3, 3)

5070-80 Modern Transform Methods (3) La-place transform and complex variable theory. Z-transform, difference equations and distributed parameter systems.


5120 Network Synthesis and Design (3) Frequency domain and time domain synthesis of network functions; realization of one-port and two-port networks by R, L, and C. Steady-state approximation problem and filter design; computer aided techniques. Prereq: 5070 or equivalent.


5170 Bioengineering Systems I Models, Systems Analysis, Part (4040) Modeling techniques applied to physiological systems. Systems properties of resistance, impedance, and storage are investigated. Analog and digital simulation of biological systems. Prereq: 4370 or consent of instructor.

5175 Introduction to Logic Design (3) Combinational and sequential network design. Digital modules and memory devices. Asynchronous and synchronous machines. Machines as digital automata; identification experiments on sequential machines. Biweekly lab. Prereq: Elementary logic circuits and understanding of several variables. (Same as Computer Science 5175.)

5180 Bioengineering Systems II Bioelectric Phenomena (3) Electrical phenomena associated with biological systems, including: bioelectric potential, transducers, amplifiers, and biophysical data of several biological systems. Prereq: Consent of instructor.

5190 Bioengineering Systems III Instrumentation and Analysis (3) Process by which information is gathered and transmitted from biological systems. Basic measurement techniques, estimation theory, system modeling and stability analysis; system response analysis; design of estimator and observer system. Compensations on engineering aspects of control systems. Coreq: 5070 or equivalent.

5210-20 Advanced Electrical Machinery (3, 3) Fundamental processes of electromechanical energy conversion; application in conventional devices. Differential equations for rotating machinery. Park's transformation and two-axis model, transient behavior, isolating and using rotating machines. Prereq: 4780 or equivalent.

5230 Advanced Electrical Machinery Applications (3) Linear motors; pole amplitude modulation and digital control systems; variable frequency operation. Prereq: 5210.

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, the system model, system stability, system analysis; system response analysis; design of estimator and observer system. Compensations on engineering aspects of control systems. Coreq: 5070 or equivalent.

5271 Modern Systems Theory I (3) Introduction to linear systems theory. State-space model, linear dynamical systems, linear quadratic Gaussian systems design, exponential, controllability, observability, reality, topology, 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.


5310 Basic Requirements for Plasma Fusion (3) Historical study of fusion systems in nature. Lawson 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, accessibility, ignition and burn, laser fusion, inertial confinement, magnetic fusion hybrids; Prereq: Consent of instructor or plasma engineering or physics background or employment in fusion work.


5360 Application of Quantum Electronic Devices (3) Coherence properties of laser radiation and "near-resonance" experiments. Lasers in communication and instrumentation systems. Specific application examples: plasma diagnostics, Raman emission spectroscopy, optical harmonic generation, holography, metal-working, and biological and medical uses. Prereq: Mathematics 4740 or equivalent.

5370 Advanced Direct Electrical Energy Conversion (3) Theory, latest devices, and applications for production of electrical energy by solid state means of so-called "solid fuel". Design, operation, control; 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5380 Advanced Direct Electrical Energy Conversion (3) Theory, latest devices, and applications for production of electrical energy by gaseous means of thermionic, magnetohydrodynamic, and gas thermionic devices. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5390 Advanced Direct Electrical Energy Conversion (3) Theory, latest devices, and applications for production of electrical energy by gaseous means of thermionic, magnetohydrodynamic, and gas thermionic devices. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.

5400 Power System Networks (3) Sequence impedance for transmission line, machines, and transformers. Formation of system network characteristics such as Z, Y, and, others. Computer methods. Prereq: Graduate standing or consent of instructor.

5420 Fault and Load Flow Studies (3) Analysis of power system under shunt and series fault conditions. Computer methods for fault studies. Load flow problem is formulated with computer methods emphasized. Prereq: 5410 or consent of instructor.


5440 Distribution System (3) Electric power distribution with particular reference to utility systems. System growth and 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 relaying. Prereq: 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 latest devices, and engineering approaches such as bipolar transistors, J-FETS, and MOSFETS. Small-signal equivalent circuits and noise models of active devices. Linear and nonlinear amplifiers, low-noise feedback amplifiers and radio-frequency amplifiers using discrete, monolithic and hybrid devices. Frequency response analysis and design. Coreq: Mathematics 4510 or 4710. Project laboratories included.

5540 Thick-Film Hybrid Microcircuits (3) Processing and basic design techniques for prototype production of hybrid-thick-film integrated circuits; from circuit design through build and test of thick-film pastes; cost-effective design techniques. Project oriented, includes biweekly laboratory.

5570-80-90 Advanced Electronic Switching Circuits (3, 3, 3) Switching circuits using active devices in discrete, digital and hybrid configurations; clipping and clamping circuits, negative resistance circuits, comparators, time-base generators, sweep circuits, clocking, synchronization, switches, logic, families, registers and counters, analog-to-digital and digital-to-analog converters, and digital memories. Prereq: 4700 or consent of instructor. Project laboratory included.


5615-25 Introduction to Switching Theory and Logic Design (3, 3) Boolean algebra and applications. Combinational switching circuits. Sequential machines. Information structures and sub-systems. For computer science majors and those without prior experience in hardware and logic design. Prereq: Elementary set theory and calculus of several variables. 4 labs per quarter.


5650-60 Electronic Communication Systems (3, 3) Information transmission in communications systems; mathematical treatment of modulation and demodulation in analog and pulse-type systems. Bandwidth requirements, noise, system performance in noise. All modern systems; emphasis on digital data systems. Prereq: 5670-25. 4 labs.

5670-80 Pattern Recognition (3, 3) (Same as Computer Science 5840-50.)

5690 Artificial Intelligence (3) (Same as Computer Science 5210.)

5710 Random Process Theory for Engineers (3) Probability and random variables as approached by various methods. Probability, characteristic functions, and distributions of random variables. Random processes, stationarity, correlation functions and temporal analysis, power spectrum and spectral analysis applied to response of systems to random signals.


5740 Digital Processing of Signals (3) Analysis of digital filters. Optimum linear and non-linear design. Aspect of designing digital filters; its implications; frequency domain design of digital filters; time domain design of digital filters; quantization effects; computer processing and computer-posed Fourier transform. Prereq: 4100 or equivalent.


5770 System Identification (3) Various identification schemes; deterministic, stochastic, and hierarchical methods for system modeling and identification and engineering science. Prereq: Consent of instructor.

5800 Power Transmission Lines (3) New and unconventional power transmission systems. Transmission line parameters for overhead and underground lines. Corona and radio interference of high voltage transmission. Isolation coordination and protection. Design procedures for high voltage transmission. Prereq: 4410-20-30 or equivalent.

5810-20 Electromagnetic Fields (3, 3) Vector analysis, Maxwell's equations, taper, relativity, plane waves, reflections, waves in anisotropic media, guided waves, rectangular and cylindrical wave guides, radiation from current elements. Consent of instructor.

5830 Linear Antennas and Antenna Arrays (3) Hertzian dipole, linear antennas, impedance loop antennas, receiving antennas, linear arrays. Prereq: 5820.

5840 Aperture Antennas (3) Huygens principle, equivalent currents, Fourier transform and optical transfer function. Horn, lens, and reflector antennas. Prereq: 5820.

5850 Microwave Electronics (3) Space charge waves on electron beams, coupling between beams and guided waves. Klystrons, magnetrons, traveling wave amplifiers and backward wave oscillators. Prereq: 5820.

5860 Electromagnetic Wave Propagation (3) Waveguides, transmission lines, waveguide components, time delay systems, propagation in dispersive media, transmitting and receiving antennas, guiding media, waveguide propagation, radiation from current elements. Consent of instructor.

5870 Introductory Microwave Networks (3) Circuit equivalents for n-port, junctions, obstacles, loading and coupling. One way and two way devices, directional devices, parameter measurement, reflection charts. Prereq: 5810. Coreq: 5820.

5930 Digital Image Processing (3) Theory and techniques. Visual system models, two dimensional samplers and integrators, image intensifiers, image transform and transforms, image enhancement, restoration, reconstruction, coding, image coding techniques, image description, scene analysis and scene matching. Prereq: 4830 or consent of instructor.

5940-50 Advanced Small Computer Systems (3, 3) Real-time applications, memory and CPU organization, interface software, and peripheral devices of minicomputer and microprocessor system are studied. Project-oriented supported by hardware and software interface design. Prereq: 4850 or equivalent or consent of instructor. (Same as Computer Science 5940-50.)

6000 Doctoral Research and Dissertation (3-15) P/NP only. Prereq: 6070-80 (Computer Science 6070-80) and 6090-100 or consent of instructor. Course 6070-80 (Computer Science 6070-80) and 6090-100 or consent of instructor. Course 5820. Course 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, information structure and control, hierarchical systems, reliable control. 6250—Algebraic and geometric systems, theory, systems defined on groups. 6260—Qualitative analysis of systems, nonlinear analysis, stability theory. Need not be taken in sequence. Prereq: 5271-81-91 or consent of instructor.

6270-90-90 Special Topics in Systems Methodology (3, 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.


6500-10 Electrical Conduction in Gases and Plasma (3, 3) (Same as Physics 6500-10.)

6530 Special Topics in Image and Pattern Analy- sis (3) Discussion of new developments as found in current literature. Prereq: 5670-80 (Computer Science 5640-50) and 5830 or consent of instructor.


6860 Electromagnetic Diffraction and Scattering (3) Diffraction of electromagnetic waves by spheres and cylinders, ground wave propagation problem, radome design problem, creeping waves. Prereq: Precalculus Mathematics 5810 and 5820.


6760 Coding Theory (3) Mathematical structure of algebraic and probabilistic codes. Coding metrics and bounds, linear codes, linear feedback shift registers, convolutional codes, burst-error-correcting codes and decoding methods. Prereq: 5710 or consent of instructor.

6800-10-20 Advanced Topics in Electronic Instrumentation (3) Selected advanced topics in electronic instrumentation based on particular interests of students. Fundamental physical processes in instrumentation transducers for detection and their synthesis. Mathematical estimation theory. Adaptive systems. Sequential detection theory of Wald and Filippoff of sequential probability ratio test. Suboptimal detection methods. Prereq: 5710 or consent of instructor.

6910-20-30 Advanced Sequential Machine and Automata Theory (3, 3, 3) Finite-state models; algebraic structure; state diagrams, machine configurations, decomposition, partition-pairs and semigroup theorems; identification experiments, measurement and control of sequential machines; research on sequential machines and machine specifications; reliability. Logical and Boolean logic. Random processes in sequential machines. Prereq: Precalculus Mathematics 5610.

Engineering Administration

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

5900 Project in Engineering Administration (3) Study and formal report of engineering administration or engineering program. Prereq: 5502-20-30. Coreq: Coreq: Precalculus Mathematics 5610. Must register for 5900 until project is complete. S/NC only. E

Engineering Science and Mechanics

MAJOR

DEGREES

M.S., Ph.D.

Professors:


Associate Professors:


Assistant Professor:

O. Soliman, Ph.D. Tennessee

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy with a major program in Engineering Science are intended to be of 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 enrollment. The student's program of study must be approved by an advisory committee and must fulfill 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 outside the traditional boundaries between science and engineering, or can be best met by interdisciplinary study in engineering. The department's course offerings and research activities are 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 course work more than from work on a thesis.

In Plan I a minimum of 45 quarter hours, including the thesis is required. In Plan II a minimum of 45 hours is required. The requirements include the following:

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<th>Hours</th>
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<tr>
<td>Plan I</td>
<td>Plan II</td>
</tr>
<tr>
<td>Mathematics</td>
<td>9</td>
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<tr>
<td>Engineering courses</td>
<td>18</td>
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(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.)

Thesis

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, researches, examinations, faculty advisory committees, and admission to candidacy are the same as for the Master's degree. In particular, specific departmental requirements for the Ph.D. degree include:

1. A minimum of 36 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the Master's thesis. The 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 5600 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 will be limited by the approval of the student's major professor.

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 5600 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 under item 2.

5. Active participation in graduate seminars and colloquia.

6. Two doctoral examinations must be passed to be admitted to candidacy for the Ph.D. in Engineering Science.

After being admitted as a potential candidate for the Ph.D., a qualifying examination must be taken at the first offering after the student has either completed a Master's degree or completed 36 quarter hours of graduate credit. The purposes of the qualifying examination are:

(a) To determine the qualifications of the student to continue the Ph.D. program, and
(b) To identify the areas of strengths and weaknesses to guide the student's graduate course work and research.

*Engineering courses under Plan II may include advanced laboratory work or special problem work, for example Engineering Science and Mechanics 5910 or analogous courses in other departments.
The qualifying examination will be administered by the department's Graduate Studies Committee. The examination will be written and will cover at least four graduate level subject areas. One subject area will be mathematics, and the others will be designated by the student subject to the approval of the department's Graduate Studies Committee. The comprehensive examination is to be taken by students within 6 credit hours of completion of graduate course work required for the Ph.D. degree. This examination is to be administered by the student's advisory committee and shall consist of both a written and oral portion. After successfully passing the qualifying and comprehensive examinations, the student must present the Ph.D. dissertation research proposal to the student's advisory committee and obtain tentative approval of the proposal before being admitted to candidacy for the Ph.D.

8. A final examination on the student's dissertation and related fields will be taken by the student after completion of the Ph.D. dissertation and course requirements.


4010 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. Includes anatomy, physiology, biomaterials, mathematical models of body systems, Core: Mathematics 2840 or consent of instructor.

3420 Introduction to Clinical Engineering (3) Applications in clinical/hospital setting; description, analysis, and design of health care delivery systems; hospital planning 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) 3 hrs and a 3-hr lab.

3700 Dynamics (4) Kinematics of rigid bodies; mass moments of inertia; coulomb friction; kinetic of rigid bodies using force, mass, acceleration; work-energy; impulse-momentum. Not for departmental graduate credit. Prereq: 2705 or Basic Engineering 1320, 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 2850.


4520 Biomedical Fluid Mechanics (3) Discuss objectives, review foundations and present developments in biomedical and fluid mechanics. Properties of human blood and blood vessels, determinants of cardiac performance, analysis and measurement of flow in arteries, noninvasive study of circulatory system, mechanics of microcirculation. Applications to areas of hemolysis, thrombosis, and fluid machinery, medical devices. Prereq: 4500 or a course in fluid mechanics or consent of instructor.

4530 Biomechanics (3) Discuss objectives, review foundations and present developments in areas of mechanical properties of living tissues, biomechanics of injury and rehabilitation, medical applications of prosthetic devices and biomechanical problems related to impact. Prereq: 3311 or 4500 or consent of instructor.

4540 Fracture-Safe Design (3) A critical review of mechanical properties of materials that are indicative of fracture resistance, including transition temperature, R-curves, stress intensity factors, and J-integrals; the use of these properties in design. Prereq: 3310 and Metallurgical Engineering 2110. (Same as Metallurgical Engineering 4540.) 3 hrs or 2 hrs and 1 lab.

4580 Principles of Nondestructive Testing (3) (Same as Physics 4580.)

4610 Experimental Stress Analysis (3) Basic concepts; theory, techniques, and instrumentation of strain gage techniques; strain gage introduction; strain gage methods; strain gage data presentation. Prereq: 3310, Electrical Engineering 3120. 3 hrs and a 3-hr lab.

4630 Dynamic Data Acquittal (4) Instrumentation of measuring systems for dynamic events and responses; signal conditioning; oscilloscopes, and sound measurement techniques. Prereq: 3311, 4710, Electrical Engineering 3120. 3 hrs and a 3-hr lab.

4830 Introductory Photomechanics (3) Introduction to photomechanics and photomechanical testing. Coreq: Mathematics 2840.

4850 Principles of Nondestructive Testing (3) (Same as Physics 4580.)

5110-20 Fluid Dynamics (3, 3) Kinematics of fluids, static and dynamic equations, fluid particle motion, streamline, vorticity, rate deformation, plane and axially symmetric flows. Prereq: Mathematics 2840. (Same as Mechanical Engineering 4520.) 3 hrs or 2 hrs and 1 lab.

5130 Anelasticity (3) Analysis of viscoelastic media. Prereq: Mathematics 2850.

5150 Elements of Continuum Mechanics (3) Current developments and applications to solids and fluids. Prereq: 3310, 3311, and Mathematics 3160.

5220 Mechanics of Viscous Flow (3) Viscous flow in porous media; applications of Navier-Stokes equations; numerical methods of solutions; stress-optic methods of laminar flow analysis. Prereq: Mathematics 4610. (Same as Chemical Engineering 5810.)


5410-20 Theory of Elasticity (3, 3) Stress, strain in three dimensions; torsion and bending of prismatic bars; axisymmetric stress distribution; stress concentration; plane stress, plane strain. Prereq: 5500.

5430 Thermal Stresses (3) Heat conduction; thermoelectric equations; thermal stresses in beams, rings, plates, and shells; thermal buckling problems. Prereq: 5410 or 5310-20-30, and Mechanical Engineering 3440.

5440 Theory of Linear Viscoelasticity (3) Linear viscoelasticity of solids; quasi-static problems; vibrations problems; dynamic problems; stability problems; two- and three-dimensional linear viscoelasticity. Prereq: 5800.


5630-40 Photoelasticity (3) Physical optics, wave motion, polarized light, basic principles of photoelasticity, equipment, and techniques, application to two-dimensional elasticity and stress concentration, numerical methods in photoelastic stress analysis, photomechanical, coating methods, two-dimensional photomechanics. Prereq: 3311, Mathematics 4610, and consent of instructor. 5640: 2 hrs and 3 labs.

5710-20 Advanced Dynamics (3, 3) Physical laws relating to the motion of particles and rigid bodies, rigid body dynamics; variational methods; Lagrange's equations; Hamilton's principle. Prereq: 3710 or 4710, Mathematics 4610.

5730 Advanced Vibrations (3) Vibrations of multi-pole degree of freedom lumped parameter systems. Iterative and approximate solutions. Introduction to random vibrations. Prereq: 4710 and 4850.

5740 Vibrations of Continuous Media (3) Equations of motion for strings, rods, beams, membranes, plates, and shells; natural modes and frequencies; response of damped and undamped components to applied dynamic loads; approximate methods of solution. Prereq: 5410 and Mathematics 4560.

5750 Orbital Mechanics (3) Planetary, satellite, and astronomical orbits and trajectories; orbital perturbation; classical principles of minimization. Prereq: 3710 and 4710.

5800 Introduction to Continuum Mechanics (3) Fundamentals of mechanics of solids and fluids; Cartesian tensors; stress, deformation, and flow in continuous medium; constitutive equations, application to solids and fluids. Prereq: 3310 and 3311 or equivalents, Mathematics 4610.


5850 Introduction to Finite Element Methods (3) General finite element procedure; convergence requirements; 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 Mechanics (3) Mechanics problems related to recent developments in mechanics. Prereq: Consent of instructor. May be repeated with consent of department.

6000 Doctoral Research and Dissertation (3-15) P/N/P only.
6110-20 Advanced Topics in Fluid Mechanics and Convective Transfer (3, 3) Survey of literature on advanced convective momentum, heat, and mass transfer; boundary layer theory based on the 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: 5110-20-30 or equivalent; Mathematics 4510, 4540-50, 420. (Same as Environmental Engineering 6110-20-20.)


6310 Theory of Plates (3) Classical theory of bending of plates of various shapes; thick plates; plates of variable thickness; buckling and large deflection problems. Prereq: 5110-20.

6320 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory, and applications of theory for structural engineer. Prereq: 6310 or Civil Engineering 5160.


6340 Theory of Plasticity (3) Yield conditions; strain hardening; general constitutive equations; plastic potential, uniqueness theorems; extremum variational principles; problem of perfectly plastic solids; finite plastic deformations; piecewise 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 apparatus for performing photoelasticity, scattered light method, dynamic photoelasticity, photothermoelasticity, photoplasticity and photosensitive materials and properties. Prereq: 5640, 5420, and consent of instructor. 2 hrs and 3 labs.


6800 Nonlinear Viscoelasticity (3) (Same as Polymer Engineering 6210.)

6810 Energy Methods (3) Virtual work, minimum potential energy, and complementary energy. Castiglione's theorem, Hamilton's principle, and Lagrange's equation of motion; variational methods; exact and approximate solutions to ordinary and partial differential equations, and vibrational problems; principles of perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Prereq: 5410 and Mathematics 4550.

6820 Advanced Topics in Fluid Mechanics and Convective Transfer (3, 3) Survey of literature on advanced convective momentum, heat, and mass transfer; boundary layer theory based on the 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: 5110-20-30 or equivalent; Mathematics 4510, 4540-50, 420. (Same as Environmental Engineering 6110-20-20.)

6830 Theory of Plates (3) Classical theory of bending of plates of various shapes; thick plates; plates of variable thickness; buckling and large deflection problems. Prereq: 5110-20.

6840 Theory of Plasticity (3) Yield conditions; strain hardening; general constitutive equations; plastic potential, uniqueness theorems; extremum variational principles; problem of perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Prereq: 5410 and Mathematics 4550.

6810 Photoelasticity (3) Stress-optic law in three dimensions and index ellipsoid, rotational effects in three-dimensional photoelasticity, techniques and apparatus for performing photoelasticity, scattered light method, dynamic photoelasticity, photothermoelasticity, photoplasticity and photosensitive materials and properties. Prereq: 5640, 5420, and consent of instructor. 2 hrs and 3 labs.

6830 Theory of Plates (3) Classical theory of bending of plates of various shapes; thick plates; plates of variable thickness; buckling and large deflection problems. Prereq: 5110-20.

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6810 Photoelasticity (3) Stress-optic law in three dimensions and index ellipsoid, rotational effects in three-dimensional photoelasticity, techniques and apparatus for performing photoelasticity, scattered light method, dynamic photoelasticity, photothermoelasticity, photoplasticity and photosensitive materials and properties. Prereq: 5640, 5420, and consent of instructor. 2 hrs and 3 labs.

6830 Theory of Plates (3) Classical theory of bending of plates of various shapes; thick plates; plates of variable thickness; buckling and large deflection problems. Prereq: 5110-20.

6840 Theory of Plasticity (3) Yield conditions; strain hardening; general constitutive equations; plastic potential, uniqueness theorems; extremum variational principles; problem of perfectly plastic solids; finite plastic deformations; piecewise linear plasticity. Prereq: 5410 and Mathematics 4550.
accidents with emphasis on OSHA Rules and Regulations.
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Repeated 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
5110 Work Design (3) Advanced methods analysis of design and improvement of work systems, human factors, workers' response and management participation. Prerequisites: Motion and time study or work methods and design.
5210 Advanced Work Measurement (3) Characteristics of predetermined time systems, application to formula construction, and practice in application. Prereq: 3600 or 3620.
5240 Facilities Planning and Design (3) Modern materials handling techniques, computer-aided layout techniques, applications of operations research models, and use of these to design manufacturing facility. Prereq: Production facilities planning or consent of instructor.
5250 Advanced Scheduling (3) Scheduling problems related to industrial and/or computer applications. Application, analysis, and development of heuristic procedures for scheduling. Emphasis on objectives and costs of scheduling. Prereq: 4230.
5260 Information Systems Design (3) Systems engineering approach to information systems design. System model, analysis, and evaluation of information systems, information objectives and design criteria. Optimization and simulation in system design.
5360 Statistical Methods in Industrial Engineering (3) Analysis and interpretation of data collected in application of industrial engineering techniques. Prereq: or consent of instructor.
5420 Reliability Engineering (3) Reliability concepts, failure distribution, equipment reliability, time dependent and Markov dependent systems. Maintenance data analysis and replacement problems. Prereq: Engineering 4350.
5600 Human Factors Engineering (3) Human characteristics which influence design of tools, equipment, environments, and products. Modeling of human as part of system or control. Prereq: Consent of instructor.
5610 Human Factors Engineering (3) Human operator, performance characteristics, and environmental requirements. Formal description of human operator behavior, critical study of parametric effects through questionnaire models and models describing operator as informa- tion processor. Prereq: 5600.
5701 Operations Research Applications (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 Search Programming (3) Mathematical programming; linear programming, quadratic programming, and separable programming. Computer solutions to programming problems. Prereq: Computer Science 3150 and matrix algebra.
5720 Queuing Models and Simulation (3) Theory and application of queueing models and simulation models employed to evaluate complex queueing systems. Data analysis and hypothesis testing relevant to pertinent waiting line probability density functions. Prereq: 5700, 5760.
5730 Game Theory and Random Processes (3) Operations research theory with emphasis on its application to decision making in competitive environment, and random processes with applications to queuing, inventory models and decision making. Prereq: 5360.
5830 Health Systems Engineering II (3) Health systems for function and improvement of function and total health system. Prereq: 4830.
5900 Design Project (1-9) Industrial engineering topics to fulfill design project requirement in non-thesis program. Enrollment limited to industrial engineering students. May be repeated. Maximum 9 hrs. S/NC only.
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 various constraints. Applying optimization theory to solve nonlinear optimization problems. Variable metric methods, search methods, constrained nonlinear programming, and penalty function methods. Prereq: 5710.
6910 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 and consent of instructor. May be repeated with consent of department.

Mechanical and Aerospace Engineering
Physical Science
MAJORS
Aerospace Engineering
M.E., M.S., Ph.D.
Mechanical Engineering
M.E., M.S., Ph.D.

DEGREES
Aerospace Engineering
M.E., M.S., Ph.D.
Mechanical Engineering
M.E., M.S., Ph.D.

Assistant Professors:
R. C. Arnold, Ph.D., Virginia Polytechnic; S. E. Becker, Ph.D., North Carolina State, P.E.; G. W. Brown, M.S., Tennessee State, P.E.; S. N. Chaudhuri, Ph.D., Indian Institute; S. E. Becker, Ph.D., North Carolina State, P.E.; F. Shahrokhi, Ph.D., Oklahoma State; F. H. Speckhardt, Ph.D., Georgia Institute of Technology; P. E., W. K. Stair, M.S., Tennessee; H. J. Wilkinson, Ph.D., Pennsylvania State, P.E.; J. Wu, Ph.D., California Institute of Technology; Y. L. Wu, Ph.D., California Institute of Technology; R. L. Young, Ph.D., Northern California, P.E.

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 College, each student must satisfactorily complete a program of study which has been approved by the student's committee. Specific program requirements are given below.

M.S. IN MECHANICAL ENGINEERING
Graduate programs in Mechanical 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 College, each student must satisfactorily complete a program of study which has been approved by the student's committee. Specific program requirements are given below.

M.S. IN AEROSPACE ENGINEERING

M.S. IN AEROSPACE ENGINEERING

M.S. IN AEROSPACE ENGINEERING
student's advisor will assist in planning the program of study to ensure that it includes the necessary design content.

**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.

**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 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 of credit in thesis.
   3. Participation in the departmental seminar program.
   4. Submission and defense of a written thesis which demonstrates the ability to conduct and report on an independent investigation.
   5. Passing a final examination on all work submitted for the degree.

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.
   2. Participation in the departmental seminar program.
   3. Passing a comprehensive written final examination on all course work submitted for the degree. The student's committee will be of sufficient size to include all the study areas reflected in the course program.

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.
   3. Participation in the departmental seminar program.
   4. Passing a comprehensive written final examination of course work submitted for the degree and an oral examination of all work (including problems) submitted for the degree.

**THE DOCTORAL PROGRAM**

Admission into the doctoral program will be granted to those applicants who have demonstrated superior achievement in their engineering backgrounds.

The student must satisfactorily complete an approved program of study 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 and 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 aerospace 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 technologies 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.

**3111 Engineering Thermodynamics (3)** Energy and laws governing energy transformations; thermodynamic properties.

**3330 Engineering Thermodynamics (3)** Properties of gases and mixtures; 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 (3, 3, 3)** Fundamental principles of thermodynamics and transport phenomena as applied to engineering design. To be taken in sequence.

**3560 Mechanics of Machinery—Kinematics (3)** Machine motions; graphical and analytical methods; instantaneous 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.


**3650 Introduction to Machine Design (3)** Ductile-brittle behavior of materials under static and cyclic loading. Stress concentration 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.

**4140 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.

**4180 Design of Energy Conversion Systems (3)** Synthesis and design of systems including economic and technical aspects. Participation in team design projects including formal presentations and design reports.

**4170 Turbo-Machinery (3)** Basic principles of turbomachinery; systematic methods or analysis, design, performance evaluation.

**4180 Energy Production and Utilization (5)** 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 accident measurement; control 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 of sliding bearings; 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, dynamic characteristics and stability of systems, numerical simulations, and analog computer solutions. Not for graduate departmental 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 machining 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.


**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 products to reduce cost. 2 hrs and 1-2 hr lab.

**4625 Manufacturing Process Engineering I (3)** Product specifications, functional analysis of size and form; true position tolerance theory; tolerance analysis; and workpiece control for production to tolerance.

**4631 Energy Methods in Mechanical Design (3)** Application of strain energy principles in complex beams and structures.
4560 Materials and Manufacturing Process (3) Selection of materials in design process, emphasizing relationship between stress and strain analysis, machine 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 shafts, 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 machine elements, springs and shafts, selection of sleeve and rolling element bearings.

4690 Machine Design (3) Innovative design of complete machine; documentation including 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 and analysis of heating and air conditioning systems.

4740 Solar Energy Utilization (3) Nature and availability of solar energy; review of selected heat transfer topics pertinent to solar energy collection and use; design analysis of solar energy collectors and fluid propulsion systems.

4810 Internal Combustion Engines (3) Thermochemical phenomena in internal combustion and propulsion engines. Combustion, detonation, equilibrium, pollutant emissions. Analysis of internal combustion engines using ideal and real fluids.

4910-20 Selected Topics in Mechanical Engineering (3) Problems related to developments and practice in mechanical engineering.

5000 Thesis (1-15) P/NP only. 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. Prereq: consent of instructor.

5110 Conduction Heat Transfer (3) Analysis of steady state and transient heat transfer by analytical and numerical techniques. Prereq: 3910, 4420 and Mathematics 3150.

5120 Convection Heat Transfer (3) Equations of viscous fluid flow, energy equation, convection analysis of internal and external flows including effects of variable heat flux, surface temperature, and initial and boundary conditions. Prereq: 4420.


5140 Phase Change Heat Transfer (3) Fundamentals of solar radiation, modeling and prediction of nucleate, transition and film boiling; critical heat flux; forced convection boiling and post dry-out heat transfer; two phase flow. Prereq: 5120 or consent of instructor.

5210 Classical Thermodynamics (3) Macrophysical thermodynamics with emphasis on First and Second Law analyses, equilibrium criteria, and thermodynamics of phase relationships. Prereq: 3330.

5220 Microscopic Thermodynamics (3) Thermodynamic properties of kinetic theory and statistical mechanics. Prereq: 5210.

5230 Special Topics in Thermodynamics (3) Pre-req: Consent of instructor.

5310 Intermediate Fluid Mechanics (3) Vector descriptions in fluid mechanics; derivation of basic equations; two dimensional potential flows; viscous flows with emphasis on boundary-layer theory. Prereq: 3410.


5410-20-30 Research in Mechanical Engineering (3, 3, 3) Design of experiments; data analysis; experimental investigation.

5510-20-30 Mechanical Engineering Design (3, 3, 3) Design of mechanical engineering units and systems.


5601 Dynamics of Mechanical Systems (3) Computational techniques derived from Lagrangian mechanics and nonconservative systems. Application to complex mechanical systems. Prereq: 4831 or consent of instructor.

5602 Computer-Aided Mechanical Design (3) Application of transfer matrix methods to static and dynamic analysis and redesign of complex, three dimensional, statically indeterminate structures. Prereq: 5601 or consent of instructor.

5610-20-30 Experimental Stress Analysis (3, 3, 3) Theory of elasticity, experimental methods; photoelasticity, strain gages, lacquer coatings.


5670-80 Dynamics of Machinery (3, 3) Kinematics and dynamics; rigid bodies; Lagrangian methods. Prereq: 3820, 3910.

5690 Vibrations of Mechanical Systems (3) Free and forced vibrations of single and multiple degree of freedom systems; linear and nonlinear. Prereq: 3630.


5810-20-30 Rockwell Propulsion System (3, 3, 3) Rocket propulsion fundamentals. Chemical, electric, and nuclear propulsion systems.

5840-50-60 Turbomachinery Systems (3, 3, 3) Design, development, and systems integration of turbine components. Prereq: First year graduate standing and consent of instructor.

5870 Dynamic Modeling and Simulation (3) Modeling physical systems including mechanical, thermal, hydraulic, pneumatic and electromechanical systems. Techniques for experimentally determining system parameters. Analog and digital computer simulation techniques. Prereq: 3630, 4420, and Aerospace Engineering 3511.

5900 Selected Engineering Problems (3-9) Selected problems in mechanical engineering to fulfill requirement of Problems Program. Enrollment limited to first year graduate students. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) All phases of mechanical engineering, including reports on current research at the University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Mechanical Engineering (1-3) May be repeated.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6110-20 Advanced Topics in Fluid Mechanics and Heat Transfer (3, 3) Advanced theory and applications of fluid mechanics and heat transfer; turbulent and laminar flow, boundary-layer flow; radiative and convective heat transfer; advanced topics in multiphase flow. Prereq: Consent of instructor.

6130-40 Advanced Radiation Heat Transfer (3, 3) Radiation heat transfer in absorbing, emitting and scattering media; interaction of thermal radiation with condensed and convective heat transfer; radiation heat transfer in hypersonic flow; radiative characteristics of luminous flames and nonuniform gases; scattering by planetary atmospheres. Prereq: 5110-20-30; Mathematics 4550.

6240 Selected Topics in Thermodynamics (3) Comparison of macroscopic and microscopic approach; equilibrium of pure substance; metastable states. Prereq: Consent of instructor.

6300 Selected Topics in Thermodynamics (3)

6610 Engineering Vibrations (3) Mechanical transients in single and multiple degree of freedom systems. Prereq: Consent of instructor.

6810 Engineering Vibrations (3) Mechanical transients in single and multiple degree of freedom systems. Prereq: Consent of instructor.

6910 Aerospace Engineering (3) Atmosphere, dynamics and thermodynamics of perfect gases, fluid flow types, airfoil theory, wing theory, drag. For non-aerospace engineering majors only.

6920 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.

6930 Compressible Flow (3) One-dimensional internal flow; shock and expansion waves; friction and nonadiabatic flow.

6940 Low Speed Aerodynamics (3) Potential flow theory; kinematics and dynamics of perfect fluids; analysis and design of aerodynamic bodies.

6950 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods.

6960 Astronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems.

6970 Propulsion (3) Principles of propulsion devices; rocket, ramjet, and ramjet engines.

7260 System Design (3) Synthesis and design of complex aerospace system including economic 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, reporting experimental tests run according to test standards and other specifications.

5100 Airplane Performance (3) Introduction to airfoil and wing characteristics, drag, propellers; static
Mathematics 4250. 

req : 4220 or Mechanical Engineering 5310, about a body; conformal mapping; hodographs. Pre-

tics and dynamics of perfect fluids ; potential flow

degree requirements. May be repeated. S/NC only. E

degree is completed. May not be used toward de-

5100-60-70 Air Vehicle Aerodynamics and Per-
formances (3, 3, 3) Application of aerodynamics to
air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to supersonic and hypersonic speeds. Relations among thrust, drag, lift and altitude. Propulsion systems, vehicle performance, turbulence, and trajectory optimization. Prereq: 4220. 

5210-20 Aerodynamics of Compressible Fluids
(3, 3) One-dimensional flow; waves; small-perturba-
tion theory, slender body theory; similarity rules; molecular fluids; gas-dynamics. Prereq: 4210 for 5210, and 5210 for 5220. 

5240 Dynamics of Viscous Fluids (3) Equations of viscous fluid flow; laminar and turbulent flow; trans-

ance and characteristics of potential flow. Prereq: 4220 or 5240. 

5250 Introduction to Hypersonic Flow (3) Slender
body flow; theory; Newtonian theory; blunt body flow; viscous interactions; free molecule and rarefied gas flow. Prereq: 5240. 

5260 Selected Topics in Aerodynamics (3) Trans-
sonic, supersonic, and hypersonic flow theories. May be repeated. Maximum 9 hrs. 

5270-80-90 Aerospace Ground Test Facilities (3, 3, 3) Atmospheric models and similarity consid-
tions. Aerodynamic test facilities including wind tun-

nels, model testing, and ballistic range. Launch and propulsion test facilities for air breathing and rocket engines. Space environment. Theoretical and prac-
tical considerations of space environment test facil-
ty. Prereq: 5240, Mechanical Engineering 5130 and 5230. 

5310 Magnetohydrodynamics (I) Electromagnetic field theory; chemical kinetics, thermodynamics and theoretics of fluid of aeronautics. Turbo-

machinery, noise, jet, and general theoretical develop-
ments, empirical equations. Prereq: 5610. 

5610 Aircraft Acoustics (3) Special topics and recent research including noise measured in aircraft. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. 

5620 Aerocoustics (3) Special topics and recent research including noise measured in aircraft. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. 

5990 Special Topics in Aerospace Engineering
Credit to be arranged; 3 hrs maximum each quarter. 

6410 Physical Gasdynamics (3) High-speed, high
temperature flow of gas from molecular point of view; molecular collision and vibrational processes and equilibrium properties of gases and gas mixtures from steady-state kinetic theory; chemical ther-

odynamics, 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 shock waves; flow with vibrational and chemi-

cal nonequilibrium. Prereq: 6410. 

5610-20-30 Advanced Aerodynamics (3, 3, 3) Sub-
sonic, transonic, supersonic, and hypersonic flows treated in a generalized and unified manner with combined viscous-inviscid effects. Relationships among various regimes of fluid flows. Fundamental assumptions, limitations of approximations and con-

sequences. Foundations of gas dynamics with emphasis on applications to airplane, rocket, ground testing, and jet propulsion. Discussion of special topics according to students' interest. Prereq: 5110, 5220, and 5240 or equivalent. 

6810 Advanced Boundary Layer Theory (3) De-
rivation and critical review of governing equations. Asymptotic solutions; similarity methods; boundary layer approximations. Approximate integral methods to include compressibility, and heat transfer. Analytical and experimental results. Prereq: 5220, and 5240 for 5220. 

6910 Advanced Topics in Gasdynamics (3) Select-
topics based on particular interests of stu-
dents: nonequilibrium transport phenomena, radia-
tion gasdynamics, nonequilibrium gasdynamics flows, advanced kinetic theory, turbulence phenomena. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. 

Nuclear Engineering

MAJOR

DEGREES

Nuclear Engineering

MAJOR

DEGREES

Nuclear Engineering

MAJOR

DEGREES

Nuclear Engineering
4. Final examination covering the thesis and graduate course work. 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.

3. Final examination covering graduate course work and practice school problems.

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 satisfied:

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 out of department.

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 sciences.

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 degree from a recognized university, with a major in engineering or physics, and present at least a B average. All candidates will be required to demonstrate general competence in a comprehensive examination in the areas of engineering science, mathematics, and physics. At the same time, all candidates will be required to demonstrate special competence in nuclear design.

Specific course requirements for the Ph.D. 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 and above from a discipline 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 laws; 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 diagnostics; thermonuclear devices. Prereq: Physics 3750, Mathematics 4550. F

4210-20-30 Nuclear Engineering Laboratory (3, 3, 3) Radiation detection and counting instrumentation, counting statistics, half-life and decay schemes, gamma spectrum and spectrometrical measurements, analog computation, diffusion properties of neutrons, critical loading experiments, control rod calibration, statistical weight, shielding, xenon poisoning, prompt critical reactor behavior, fission density and adjoint 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 heat 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 with neutronic and thermal reactor 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, shield design. Prereq: Physics 3720, Mathematics 4550. F

4820 Reactor Kinetics and Controls (3) Derivation of kinetic equations; basic kinetic parameters; transient response with 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: Consent of instructor. 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) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required of students not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is approved. May not be used toward degree requirements. Must 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; combustion; radiation; reactor core thermal analysis. Prereq: 4720 or equivalent, Mathematics 4710, 4550. F; W, Sp

5210 System Dynamics (3) Transient analysis, Laplace transforms, block diagrams, state equations (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. Modeling of neutronic and non-neutronic processes. Dynamics, stability, and control of zero power reactors and power reactor systems. Prereq: 4210, 4130 or equivalent. W

5230 Experimental Methods in Reactor Dynamics (3) Measuring system dynamic characteristics in time domain and frequency domain. Measurement and analysis, and interpretation of dynamics data using random and deterministic system perturbation. Prereq: 5220. Sp

5240 Reactor instrumentation (3) Instrument components and systems for operation, control, and safety of nuclear reactors; role of instrumentation in public health and safety. Instrumentation for the protection of nuclear power plants. Prereq: 4820, or consent of instructor. A

5310-20-30 Nuclear Systems Reliability (3, 3, 3) System 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 rates 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: fuel groups, discrete ordinate theory, multi-group PN theory, integral transport theory, perturbation theory, and others. Generation of required multi-group constants formulated with available point data and Nordheim treatment in solving 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 computing imbedding cases studied. Prereq: 4810. F


5810 Fundamentals of Fusion Physics and Engineering (3) Basics of fusion plasma physics and description of fusion engineering problems. Plasma properties; collision processes; electromagnetism; fusion reactor systems; kinetic theory; fluid equations; plasma equilibria, transport, and stability; plasma heating and fueling; confinement experiments; engineering of basic and advanced tokamak devices; basic plasma components; and fundamental fusion engineering problem areas.
5820 Plasma Engineering (3) Integration of plasma physics models, fusion engineering design criteria, and fusion technology constraints into design of fusion plasma experiments and reactors. Requirements of fusion reactors: particle, momentum, and energy balance equations; burn dynamics; power balance; fuel cycles, heating and fueling requirements; plasma wall interaction; and simulation of various fusion reactor plasmas. Prereq: 5810.

5830 Fusion Technology (3) Engineering problems associated with fusion reactor design: vacuum and magnetics systems; materials and irradiation; plasma heating, fueling, and impurity control; first wall, blanket, shield, and neutronics; electrical systems; maintenance, environment; and review of major reactor design studies. Prereq: 5820.

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) P/NP only. 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. Su

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
Nancy Beick, Dean
Jay Stauss, Associate Dean, Graduate Studies and Research
Fran Andrews, Assistant Dean, Undergraduate Studies
Helen Grove, Assistant to the Dean

College of Home Economics

Programs Leading to the Degree of Master of Science

Thesis Option:
Child and Family Studies
Consumer Studies and Housing: Public Policy
Food Science
Food Systems Administration
Nutrition
Textiles and Clothing

Major (minimum of 9 hours of 5000 courses) 18 hrs
Thesis 9 hrs
Minor area(s) of study (minimum of 12 hours of 5000 courses) 18 hrs
Total 45 hrs

A minimum of 30 hours at or above the 5000-level is required.

Non-Thesis Option:
The non-thesis program of study for all majors except Consumer Studies and Housing: Public Policy will consist of 45 credit hours with a minimum of 24 hours in the major 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. A written comprehensive examination is required.

Consumer Studies and Housing: Public Policy
The Master of Science 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 also be drawn from any unit within the University. A minimum of 9 hours must be taken outside the College, and a minimum of 27 credit hours within the College. A minimum of 30 hours at the 5000-6000 level is required. Students must 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 includes 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 thesis to include a minimum of 12 quarter hours of 6000-level courses.
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.}

Other Requirements:

Interdisciplinary Option: The interdisciplinary option of the Doctor of Philosophy degree in Home Economics provides for advanced graduate study with an approach that focuses on the development, integration, and application of knowledge to innovative solutions of the multi-level problems of society. A student in the interdisciplinary doctoral program is in the relatively unique position of having a number of alternatives available which are developed as a function of the student's creativity within the general framework:

- 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 community action
  - cultural, economic, and technological influences on food selection.

- Environmental Factors (base department of Textiles, Merchandising, and Design or Nutrition and Food Sciences):
  - design, space planning, housing, food service systems, clothing, and textiles as they relate to human needs
  - cultural, sociological, psychological, and economic change
  - technological developments
• aesthetics in improving the quality of the environment.

Consumers' Economic and Social Well-being (base department of Child and Family Studies; Textiles, Merchandising, and Design; or Nutrition and Food Sciences):
• relationship between family structure and decision-making processes in the use of human resources
• effects of social macro- and microeconomics and political development on consumption patterns and other behavior
• community programs to meet the socioeconomic needs of consumers.

1. Home Economics 6110-20; prerequisite is 5010.
2. Twenty-four to 36 hours from two areas in the College of Home Economics.
3. Fifteen to 24 hours in collateral or supporting courses 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 hour research methods from Food Science 5510 or 5520 or Food Systems Administration 5210; 6 hours from Food Science 5610-20-30-40, 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.

Nourishment 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 science or in food systems administration.
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 or the nutrition 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.

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 doctoral program in Home Economics at The University of Tennessee, Knoxville, who are residents of Alabama, Arkansas, Georgia, Kentucky, Louisiana, Mississippi, South Carolina, or West Virginia are eligible to participate in the Academic Common Market. Those who plan to enter a Master's program in Food Systems Administration in the College of Home Economics and are residents of Arkansas, Kentucky, or West Virginia also are eligible. Those who plan to enter the Master's program in Nutrition (public health) and are residents of Alabama, Kentucky, or Virginia are eligible. Those who plan to enter the Master's program in Consumer Studies and Housing: Public Policy and are residents of South Carolina are eligible.

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 37996-1900
Phone: (615) 974-5221
Graduate Record Examination scores for the aptitude and quantitative, verbal, and analytical sections are required for application to all programs except Interior Design and Housing and Textiles and Clothing.

Departments of Instruction
Child and Family Studies

MAJORS
Child and Family Studies
Consumer Studies and Housing:
Public Policy

DEGREES
M.S. Ph.D.

Professors:
N. Beck (Dean), Ph.D. Michigan State; V. M. Nordquist, Ph.D. Tennessee; P. White (Head), Ed.D. Tennessee;

Associate Professors:
J. C. Cunningham, Ph.D. Michigan State; D. B. Eastwood, Ph.D. Tufts; J. Stauss (Associate Dean), Ph.D. Washington State; R. M. Swagler, Ph.D. Ohio State; S. Twardo, Ph.D. Kansas;

Assistant Professors:
J. Allen, Ph.D. Purdue; C. Buhler, Ph.D. Minnesota; A. Cox, M.S. Tennessee; G. Eastman, Ph.D. Cornell; J. Kiedwiel, Ph.D. Purdue; G. Peterson, Ph.D. Brigham Young; C. Schrnam, Ph.D. Tennessee; L. Southworth, Ph.D. Tennessee; K. G. Weddle, Ph.D. Tennessee.

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.

4260 Adult Development and Aging (3) Adult life in our society. Adjustment to internal and environmental changes through 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.

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.

4430 Family Interaction (3) Dynamics of family interaction at different points in the life cycle. Includes dynamics of parent-child relationships and the marital dyad, with family and as family interacts within community, formal and informal support systems within community. Prereq: 3515.

4610 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.

4620 Administration of Programs for Young Children (3) Planning, starting, housing, funding, scheduling, and financing for day care of infants and young children, nursery school programs, and specialized 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.

4920 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 and opportunities associated with government protection of consumers. Prereq: Economics 2110, W, Sp

5000 Thesis (1-15) P/NP only 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

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 (2) 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 Consumer 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: 4830 or 5170 or consent of instructor.

5150 Assessment of Family Behavior (3) Methods of measurement related to study of family. Current methodological issues. Prereq: 5410 or 5530 or consent of instructor.

5160 Management of Time and Energy in the Home (3) Labor-saving methods and devices for...
Nursery School Administration (3) Organizational and operating principles and techniques for school children. Housing, staff, schedules, programs, financing. Prereq: 4110 or equivalent.

Seminar in Infant Development (3) Theory and research relating to infant development of course. Prereq: 3220.

Teaching Child and Family Studies (5) Seminar and practicum in techniques for teaching child development and family relationships. Prereq: Consent of instructor. S/NC only.


Consumer Protection (3) Regulatory agencies, standards, information disclosure and other consumer protection characteristics. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Children's Effects on Parents and Marriage (3) Theory and research about how children change parents and influence marital relationships. Prereq: 4350 or consent of instructor.


Children's Effects on Parents and Marriage (3) Theory and research about how children change parents and influence marital relationships. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.


Elementary and Secondary Education (3) Issues and evaluations. Prereq: 5410 or consent of instructor.

Field experience in planned parenthood programs and clinics. Prereq: 5170 or consent of instructor. May be repeated. Maximum 12 hrs.


5800 Problems in Child, Family and Consumer Studies (1-3) Advanced study of child development and family variables in family planning programs. In- 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


Advanced Topics (3) Individual study and research. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Individual and Family Development—Physiological Determinants (3) Family members' physiological potential, development, and status. Family's contribution to members' physiological potential for growth and development and to realization of human potential. Prereq: 4 hrs advanced child and family studies, 4 hrs nutrition, 4 hrs physiology, or equivalent. Sp

Individual and Family Development: Cognition (3) Processes through which human individuals learn to understand their environment. Prereq: Consent of instructor. Involves 3000-level courses in child, family and consumer studies. May be repeated. Maximum 9 hrs.

Individual and Family Development: Socialization (3) Processes of socialization throughout life cycle. Family as primary socializing agent. Prereq: 5210, 5410, or equivalent.

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.

Seminar in Programs for Infants and Preschool 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.

Applied Behavior Analysis in Natural Settings (3, 4) Individual supervision in application of applied behavior analysis in natural settings. Prereq: 5420 or consent of instructor.

Elements of Consumer Choice (3) Analysis of consumer decision making, theory of consumer choice. Impact of affluence on consumers, and con-
concentration in home economics education. Inquiries may be addressed to Home Economics Education, Home Economics Building. (See page 60 for staff, program descriptions, and course offerings).

### Nutrition and Food Sciences

<table>
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<tr>
<th>MAJORS</th>
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<tr>
<td>Food Science</td>
<td>M.S.</td>
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<tr>
<td>Nutrition</td>
<td>M.S.</td>
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<tr>
<td>Food Systems Administration</td>
<td>M.S.</td>
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<tr>
<td>Home Economics</td>
<td>Ph.D.</td>
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**Professors:**

- R. E. Beauchene, Ph.D. Kansas State; B. R. Carruth (Head), Ph.D. Missouri; M. J. Hitchcock, Ph.D. Wisconsin; J. R. Savage, Ph.D. Wisconsin; J. T. Smith, Ph.D. Missouri; M. A. Smith (Memphis), Ph.D. Tennessee.

**Assistant Professors:**

- J. B. Bitte (Memphis), Ph.D. Tennessee; M. Brooks (Memphis), M.S. Alabama; M. R. Evans, M.A. Kentucky; J. D. Skinner, Ph.D. Oregon State; C. M. Wilson, Ph.D. Missouri.

**3130 Applied Organic Chemistry (4) Basic nutrition and organic chemicals.** Prereq: Chemistry 1510-20-30. Not for graduate credit for majors.

**3140 Physiological Chemistry (4) Metabolism of carbohydrates, lipids, and proteins. Role of vitamins and minerals in metabolism. Not for graduate credit for departmental majors.** Prereq: 3130 or equivalent. Sp, Su

**4000 Origin of Food and Foodways (3) Food origin and development of individual and group foodways.** Prereq: 8 hrs social science or humanities. F, Su

**4020 Introduction to Sensory Evaluation of Foods (3) Sensory evaluation methods.** Prereq: 4010 or 9 hrs of food technology and science; Plant and Soil Science 3610 or equivalent. 2 hrs and 1 lab.

**4040 Food in Contemporary Society (3) Consumers' options, responsibilities, and potential influence with respect to food supply.** F, Su

**4050 Food Preservation (3) Application of basic principles and research findings to food preservation in home.** Prereq: 2010 or 3010, 4 hrs microbiology and 1510 or equivalent recommended. 2 hrs and 1 lab.

**4110 Introduction to Nutrition Research (3) Nutrition principles and laboratory experiences involving small animals.** Prereq: 3160. 2 hrs and 1 lab. Sp

**4130 Nutrition in Disease I (4) Nutrition problems in diseases influenced by diet.** Prereq: 3160, W, Su

**4131 Clinical Experiences in Dietetics (1) Planned clinical experiences applying principles of nutrition in disease.** Coreq: 4130. Open only to students in the coordinated undergraduate program in dietetics. Su

**4140 Nutrition in Disease II (3) Interdisciplinary lectures and discussions on the metabolic processes of normal and diseased organs and their effect on behavior or diet.** Prereq: 4130. Designed for senior students in the coordinated undergraduate program in dietetics. F

**4150 Community Nutrition (3) Nutrition problems and services in the community.** supervised field experience. Prereq: 3120 or 3160. Sp

**4190 Diet and Drug Therapy (3) Effect of drug therapy on absorption, utilization and toxicity of drugs.** Prereq: 3160 or consent of instructor.

| 4210 Design and Layout of Food Systems (3) Design of physical facilities, selection and purchasing of equipment for food service systems. | Prereq: 3220, Sp |
| 4220 Food and Lodging Information Systems (3) Design of information system for decision making in hotel-motel complex; computer application in hospitality industry. | Prereq: Accounting 2130; Computer Science 2130. |
| 4240 Food Systems Personnel Development (3) Development of training programs and personnel management policies for food systems personnel. | Prereq: Economics 3420 or Psychology 4460 or consent of instructor. |
| 4250 Food Systems Managerial Cost Control (3) Cost analysis for food and beverages; use of financial statements for decision making in food service systems. | Prereq: 3220. |
| 4260 Food and Lodging Physical Plant Planning and Maintenance (4) Fundamentals of mechanical systems and building components of food and lodging physical plant; organization and principles of property management. | Prereq: 4210. 3 hrs and 1 lab. |
| 5000 Thesis (1-15) P/NP only. | 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. Not to be used toward degree requirements. S/N only. E |
| 5010 Food Textures (3) Classification of foods according to textural parameters; instrumentation in evaluation of textures. | Prereq: 4010 or Food Technology 4020 and Soil Science 3610 or equivalent; or consent of instructor. F |
| 5020 Food Sensory Testing Methods (3) Principles and methodology of sensory evaluation of food; application of methods; analysis of sensory data. | Prereq: 4010 or Plant and Soil Science 3610 or equivalent; or consent of instructor. W |
| 5030 Advanced Experimental Food Science (3) Application of research methods to individual problems. | Prereq: 5010-20 or consent of instructor. Sp |
| 5040 Food Behavior of the Individual (3) Development of and changes in choices of food and principles of food habits of individual. | Prereq: 4000, 3 hrs of nutrition, or consent of instructor. Sp or Su |
| 5050 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 |
| 5060-65 Advanced Food Science (3) Biochemical and biophysical interactions in food. | Prereq: 4010; 3150 or equivalent, or consent of instructor. W, Sp |
| 5070 Carbohydrates and Fats in Relation to Food Science (3) Physical and chemical characteristics of sugars, starches, and fats with emphasis on their behavior in food. | Prereq: 4010; 3140-50 or equivalent. |
| 5075 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; 3140-50 or equivalent. |
| 5100 Advanced Physiological Chemistry (4) Bioenergetics and related metabolism of nutrients. | Prereq: 3140 or equivalent. 3 hrs and 1 lab. F |
| 5105 Advanced Physiological Chemistry (3) Nutritional factors in relation to body fluids, gas transport, and endocrine function. | Prereq: 3140. W |
| 5110 Community Nutrition (3) Nutrition problems and practices in community; supervised field work. | Prereq: 3160 and consent of instructor. 3 labs. F |
| 5115 Community Nutrition (3) Observations and participation in nutrition programs of local and state agencies. | Prereq: 5110 and consent of instructor. 3 labs. W |
| 5120 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. | Prereq: 5120. |
| 5125 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of depth study to be selected in consultation with instructor. | Prereq: 5115 and consent of instructor. S/NC only. Sp |
| 5130 Mental Retardation or Other Developmental Disorders of Childhood (3) Multidisciplinary core course required of all full-time students in training at Child Development Center, UT Center for the Health Sciences, Memphis. Prereq: Consent of department head. F, W, Sp |
| 5135 Nutrition in Mental Retardation and Developmental Disorders (1-12) Interdisciplinary diagnostica and treatment of developmentally-handicapped persons. | Prereq: Consent of instructor. 3 hrs and 1 lab. W |
| 5140 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. | Prereq: 3140-50-60, 31401. 2 hrs and 1 lab. |
| 5150-55 Human Nutrition (3, 3) Functions of carbohydrates, proteins, fats, minerals and vitamins. Nutrition problems related to growth and development; life span and practical problems in meeting requirements. | Prereq: 3160 and 5160. W, Su |
| 5160 Physiological Bases for Diets in Disease (3) Development of dietary treatment of disease in which nutrition plays a major role. | Prereq: 3160 or equivalent. Su |
| 5170 Survey Methods in Human Nutrition (3) Food consumption, food practices and nutritional status of population groups. | Prereq: 5150-55. 2 hrs and 1 lab. |
| 5175 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: 5150-55. Sp |
| 5180 Nutrition and Aging (2) Nutritional problems of the elderly individual and problems related to dietary intake, and effect of nutrition on rate of biological aging. | Prereq: Consent of instructor. W |
| 5210-20 Experimental Quantity Food Study (3, 3) Analysis of food production, holding environment, and service problems related to quality of food prepared in volume. Management resources. | Prereq: 3210, 3220, or consent of instructor. F, Su |
| 5230 Methods of Food Systems Research (3) Research methods applicable to food systems administration. | Prereq: 3210 or equivalent. W, A |
| 5240 Experimental Design of Food System Facilities (3) Environment in which food is prepared, held, and served in volume. | Prereq: 4210. |
| 5250 Food Systems Evaluation (3) Management resources in food systems. Standards for control. | Prereq: Consent of instructor. F |
| 5270 Administration of Food Service Delivery Systems (3) Role and responsibilities of administrator in maintaining desired qualitative and quantitative standards in food service delivery system. | Prereq: 3220 or consent of instructor. W, A |
| 5310 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 providers. Prereq: Nursing 4760 or consent of instructor. Sp

5340 Foods and Nutrition: Physicochemical Principles (3) Thermodynamics: physical-chemical properties of proteins, carbohydrates and lipids; chemistry of colloidal state; chemical kinetics; specialized kinetics of enzymatic processes. Prereq: 3140 or equivalent. Sp, A

5350-50 Research Techniques (3, 3) Human metabolic balance experiments. Analytical methods for assay of food and biological materials. Prereq: 5140. 3 labs. A

5360 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor. Sp

5700 Current Programs and Trends (1-3) Recent advances in nutrition and food sciences; implications for professionals. Prereq: Consent of instructor. May be repeated.

5800 Problems in Nutrition and Food Sciences (1-3) Advanced study in nutrition and food sciences. Prereq: Consent of instructor. May be repeated. Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

5910 Graduate Seminar in Public Health (1-2) (Same as Public Health 5900, Nursing 5900, Physical Education 5900, and Social Work 5900.) S/NC only.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E, F, A

6110 Food Dispersions (3) Physical characteristics of solutions, colloidal dispersions, and suspensions in relation to treatments applied. Prereq: 5050.

6200-30 Food and Sociocultural Change (3, 3) Critical evaluation of factors and interrelationships affecting food intake and consumption patterns. Must be taken in sequence. Prereq: 5040 or 5050; or consent of instructor. F, W

6110 Proteins and Amino Acids (3) Lectures, reports, and discussions. Prereq: 5150 or 55. Sp, A

6120 Mineral Metabolism (3) Lectures, reports, and discussions of functions of minerals in physiological processes. Prereq: 5150-55. Sp, A

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55.

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5150-55. A

6210 Manpower Planning and Training for the Food Service Industry (3) Identification of manpower needs by skill levels; programs for personnel in food service industry. Prereq: 4240, 5250 or consent of instructor. Sp

6220-30 Quantitative Methods to Control Resources 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. In sequence. Credit for 6220 contingent upon completion of 6230. F, A

6310 Advanced Topics (3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: Consent of instructor. May be repeated.

6900 Seminar (1-3) May be repeated. S/NC only. E

Textiles, Merchandising, and Design

MAJORS

Textiles and Clothing

M.S.

Interior Design and Housing

M.S.

Consumer Studies

M.S.

Housing: Public Policy

M.A.

The Economics

M.S.

The Economics

Ph.D.

DEGREES

Professors:
R. G. Blakemore, Ph.D. Florida State; J. O. Dejonge (Head), Ph.D. Iowa State; B. G. Goswami, Ph.D. Manchester (England).

Associate Professors:

Faculty Associate:
T. L. Vigo, M.S.

Assistant Professors:
C. E. Cox, Jr., Ph.D. Tennessee; S. Dillard, M.S. Tennessee; G. K. McCurry, M.S. California State.

Interior Design and Housing

A student's course of study may include intensive training in interior design beyond an undergraduate program, behavioral design research, and training in applied and conservation 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 house plans; effective use of space; maintenance problems; housing safety and restrictions; selection and neighborhood development; financing procedures. Prereq: 6 hrs from Economics 2110-20-30. Sp

4450-51 Advanced Interior Design (6, 6) Intensive interior design experiences: complex design problems using systematic design methodology. Project types: multi-family housing, commercial and institutional environments, or complex working environments. Assistance and critiques from area professionals. Prereq: 9432 for 4450. Courses taken in sequence or consent of instructor.

4781 History of Contemporary Interior Architecture (4) Furniture; design and design philosophies of Europe and America in relation to forces that shaped them; materials; methodologies; technological advances, and cultural milieu.


5000 Thesis (1-15) P/NP only. 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 Seminar in Design (3) In-depth reading, discussion, and critical evaluation of twentieth-century design concepts, persons, motivation, and creative components leading to visual innovation.

5050 Advanced Design Studio (4) Strength, structural safety, and visual potential of design materials; search for aesthetic potential in depth.

5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in housing.

5120 Historic Interior Design (3) Research studies of historic design developments. Variable course content, emphasis on interior design, furniture and/or accessories for England, Scandinavia, Mediterranea, Africa, Europe, Japan, and America. Prereq: Consent of instructor. Maximum 15 hrs.

5210 Furniture Appreciation (3) Aesthetic qualities of past and present styles. Significant structural and formal characteristics.

5310 Interior Design (3) Advanced problems in planning and design of interior space; applications of research information in making design decisions. 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 architectural environments—derivation of design implications from anatomy, physiology, anthropometry, and behavioral sciences. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5520 Environmental Factors in Interior Design (3) Systematic 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 project Maximum 9 team hrs. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5610 Furniture Design (3) Analysis of human factors and design processes in design of furniture, lighting, and storage for work and living environments. Prereq: 4320 or consent of instructor.

5613 Housing Management (3) Role and functions of housing management specialist as problems of private and assisted housing management. Prereq: 4320 or consent of instructor.

5614 Housing Regulations and Controls (3) Function of regulations in design, development, and enforcement of laws and regulations controlling the building industry. Prereq: 4320 or consent of instructor.

5615 Housing Programs and Policies (3) Analysis of private and public programs and policies to promote realization of suitable homes and living environments for families. Economic and social problems related to national housing policies. Prereq: 4320 or consent of instructor.

5620 Experimental Methods in Household Equipment (3) Research methods and techniques in determining performance and characteristics of household equipment. Prereq: Consent of instructor. 1 hr and 2 labs.

5630 Environmental Requirements for Family Work Centers (3) Planning and design of work centers for family environments: specific and general; tasks and work behavior: needs of microenvironments using human factors information. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5815 Environmental Design Research (1-3) Evaluation and application of research methodologies to interior design problems. Hours and credit arranged. Prereq: 5510-20-30 or equivalent and consent of department head and instructor in charge of investigation. Maximum 9 team hrs. E

5820 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

5830 Problems in Housing (1-3) Advanced study in housing. Hours and credit arranged. Prereq: Consent of department head and professor in charge of investigation. May be repeated. 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. Prerequisite: Consent of instructor.

6210 Environmental Design Analysis (3) Advanced methodology in psychobiology of environmental design, multidisciplinary research data and methods. Prerequisite: 5510-20-30.

6420 Perspectives in Interior Design (3) Historical influences related to contemporary concepts in interior design. Prerequisite: 5040; 6 hours 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. Prerequisite: 4010. 1 hour 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 Management (3) Management perspective of apparel production industry: production planning, processing, and management of human resources. Plant tours and case studies on production problems. Field trips required. S

5000 Thesis (1-15) P/NP only. 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 Textiles Testing and Methods of Research In Textiles (3) Physical and chemical testing. Research methods. 3 labs. Sp

5120 Advanced Problems in Textiles and Clothing (3) Refresher course; new developments in textiles. Selecting fabrics, agencies aiding consumer, and individual problems in textile field. 2 hours 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. Prerequisite: Consent of instructor. 1 hour 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. Prerequisite: 6 hours 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. Prerequisite: 5340; 6 hours 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 hour and 2 labs.

5220 Historic Textiles (3) Development of textile industry in world; fibers used, design, and color. F

5240 Practicum (1-8) Off-campus experience with business, industry, governmental agencies and civic groups; preplanned; supervised. Prerequisite: Consent of major advisor and department head. May be repeated. Maximum 9 hours. S/NC only.

5250-60-70 Problems in Textile Chemistry (4, 4, 4) Theoretical and experimental study of chemistry of textile fibers including polymerization, reactions, dyeing 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. Prerequisite: 3420 or equivalent; 1 quarter organic chemistry. 2 hours and 2 labs.

5310 Fashion Analysis (3) Fashion as social and economic force; evolutionary theories of fashion operation. Prerequisite: 6 hours each of sociology and economics.

5320 Problems in Historic Costume (3) Variable flow of styles in relation to cultural determinants. Prerequisite: 5140 or consent of instructor. May be repeated. Maximum 9 hours.

5610 Textile Processing (3) Methods and mechanics of wetting continuous filament yarns, methods and mechanics of processing staple yarns, spinning system, composite yarns weaving, knitting, non-woven fabric formation. Prerequisite: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5610.)

5620 Textile Engineering Mechanics (3) Mechanics of deformation of staple and continuous filament yarns; behavior of knit, woven and non-woven fabrics. Prerequisite: Engineering Science and Mechanics 3311, Mathematics 2840. (Same as Polymer Engineering 5620.)

5700 Current Programs and Trends In Textiles and Clothing (1-3) Pertinent developments and trends in textiles and/or clothing and implications for new types of programs, techniques and/or curricula approaches. Content and emphasis vary according to changes in field and needs of groups serviced. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hours.

5800 Problems in Textiles and Clothing (1-3) Advanced study selected from field of textiles and clothing. Prerequisite: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hours.

6010 Advanced Studies in Textiles and Clothing (3) Independent analysis of major philosophies, theories, methods, and research. Prerequisite: 5160 or consent of instructor. May be repeated. Maximum 6 hours.

6110 Selected Issues in Textiles and Clothing (3) Advanced topics of current significance. Prerequisite: Consent of instructor. May be repeated. Maximum 8 hours.

6140 Selected Behavioral Theories in Clothing (3) Role of clothing in functioning of people, utilizing behavioral theories. Prerequisite: 5170; 6 hours 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. Prerequisite: Child and Family Studies 5170, 6 hours 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. Prerequisite: 5120, 5160, 5250, or consent of instructor.

6170 Physical Performance Behavior of Textile Structures I (3) Fundamentals of yarns and fabric structures; relationship of structure to physical characteristics of textile materials. Prerequisite: 5120, or consent of instructor.

6910 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hours.
Aviation Systems

MAJOR DEGREE
Aviation Systems M.S.

Lead Professor:
M. A. Wright, Ph.D. Wales.

Professors:
W. Frost, Ph.D. Washington; W. F. Jacobs, Ph.D. Goettingen (Germany); A. A. Mason, Ph.D. Tennessee; J. M. Wu, Ph.D. California Institute of Technology; V. L. Young, Ph.D. Northwestern.

Associate Professors:
F. G. Collins, Ph.D. California (Berkeley); R. D. Kimberlin, M.S. Tennessee; J. R. Maus, 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 with a major in Aviation Systems. The Aviation Systems program is designed for those who possess a Bachelor’s degree in engineering or science and who wish to study under a “systems philosophy” toward careers in research and development or administration in 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 credit in each of the areas of research, development and administration, and electives which permit further specialization to either area.

To qualify for admission to this program, the applicant must possess a Bachelor’s degree in engineering or science from a recognized institution, show evidence of ability to pursue and benefit from the program, and fulfill The University of Tennessee Graduate School admission procedures and grade point standards. Subject matter prerequisite to the program includes basic knowledge of computer utilization (Computer Science 3150 or equivalent), a background in statistics (Statistics 3450 or equivalent), a basic understanding of aerodynamic fundamentals, aircraft propulsion and performance (Aerospace Engineering 4110 and 4120 or equivalent), a background in accounting (Accounting 5010 or equivalent basic accounting courses), a basic knowledge of economics (introductory economics or equivalent).

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, Industrial Engineering 5700 and 5710; for the administration area, Economics 5030.
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, 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, Industrial Engineering 5700, 5710, and 5720; for the administration area, Economics 5030, and Finance 5010-20.
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 Aviation Systems 5100.
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 5970.

Electives typical of those suitable for credit in the area of aviation systems, research and development include: Aerospace Engineering 5150-60-70; Computer Science 4550 and 5855-65-75; Industrial Engineering 4060, 4150, 4230, 5720, 5730, 6700, 6730; Mathematics 4225-35-45, 4510-20-30; and Metallurgical Engineering 5810-20-30; and Statistics 3450.

5000 Thesis (1-15) P/NP only. E

5070 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket and passenger handling, Airport management, economics and logistics, Interfaces with the community, collection and distribution, demand requirement analyses, types of developments and their projections. Prereq: Applied Economics 5020.

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 legisliative 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 topic, normally performed during last quarter of work toward degree in non-thesis program. For aviation systems degree candidates only.

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; J. M. Holland; J. E. Lawler; R. L. Michel.

The Comparative and Experimental Medicine degree program (M.S. and Ph.D.) is
a jointly administered graduate program intended to prepare students for teaching
and/or research careers in the health sciences. This program emphasizes the
comparative approach to the study of pathology, inheritance, mutant 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 in veterinary sciences. 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 interdisciplinairy 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 Pathology and Oncology services. For specific course listings please see
College of Veterinary Medicine, page 31 and
College of Medicine—Knoxville, page 142 in
this catalog.

ADMISSION REQUIREMENTS

General Requirements

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

Requirements for Admission to the Master of Science Degree Program

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

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

Requirements for Admission to the Doctor of Philosophy Degree Program

Applicants will generally be expected to have: Master's degree in one of the biological sciences or a professional degree in one of the medical sciences.

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

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

For additional information, see sections in this catalog on College of Veterinary Medicine and College of Medicine—Knoxville, or write to the Office of Research and Graduate Programs, P.O. Box 1071, Knoxville, TN 37901.

EcoLogy

MAJOR

DEGREES

Ecology

M.S., Ph.D.

D. L. Bunting, Chairman, Ph.D. Oklahoma State

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 advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridges topography, TVA lakes and wild rivers, provide locally a spectrum of natural habitats and consequent biological diversity that is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

Requirements for admission to this program are:

1) admission to The Graduate School; 2) chemistry through organic mathematics through calculus, 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.

concerning the admission requirements should be addressed to the Chairman, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37996-1610.

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), Ecology 5210-20-30 or approved equivalent 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 ensure an interdepartmental program, the required minimum 45 hours of graduate study includes 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 required.

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 or an approved equivalent and a minimum of 9 quarter hours of courses numbered above 6000. A student cannot enroll for dissertation until the research proposal has been discussed and approved by the doctoral committee. A foreign language is required.

Shared Faculty


The Bachelor's and doctoral programs are comprised of the major requirements for a degree. 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 departments.

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 School and the Chairperson, Industrial and Organizational Psychology Program, 413 Stokely Center for Management Studies, Knoxville, Tennessee 37996-0545. Two separate applications must be completed 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 assistantship consideration 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 admitted to the program have performed at or above the 69-79th percentile on the aptitude tests. (This corresponds to a raw score of approximately 600 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 DOCTORAL PROGRAM

I. Course Requirements (Currently under review and subject to change for Fall 1983 entrants)

A. Management or Psychology 5170-80-90.

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 650 or the 90th percentile on the GRE Advanced Test in Psychology.

B. 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.

C. 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 first attempt, at the discretion of the student's doctoral committee.

D. By the end of nine quarters a student is expected to choose a major advisor (Chairperson of Doctoral Committee).

E. Completion of an oral examination following the preparation of a doctoral dissertation. This examination covers the field of doctoral research and related topics, and must be passed at least four weeks prior to the awarding of the degree.

F. Maintenance of at least 3.0 grade point average.

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 or the qualifications for pursuing a Ph.D. are required.**

***See program handbook for definition of a B average.**
Life Sciences

MAJOR DEGREES
Life Sciences M.S., Ph.D.

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 studies 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 either 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 a 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 examination. The minimum requirements for the doctoral program include at least 9 hours above the 6000 level, 36 hours of course work 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, comparative, exercise, cellular, developmental, muscle, or neuro-physiology.

Cellular and Molecular Biology: The inter-departmental program in cellular and molecular biology includes research in structural or 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.

5110-20-30 Cellular and Molecular Biology (3, 3, 3) Survey of cell structures and functions at molecular and supramolecular level. 5110—Cellular organization; cell metabolism; energy production and use; membrane structure and function; cellular communication. 5120—Flow of biological information, cell growth and replication; cellular motility; virus-cell interactions. 5130—Structure and function of specialized cells; muscle, nerve, germ cells, blood; endocrine and immune systems; chemotaxis and phototaxis; differentiation, aging and cancer. Prereq: Consent of instructor.

Management Science

MAJOR DEGREE
Management Science M.S.

Committee:

R. S. Garfinke (Chairperson), Management Science; R. W. Boling, Management; J. S. Bradley, Mathematics; E. Glusstoff, Economics; J. K. Ho, Management Science; W. J. Morse, Accounting; R. E. Rosenthal, Management Science; R. E. Shriives, Finance; C. C. Thigpen, Statistics; M. G. Thomason, Computer Science; K. C. Gilbert, 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 150) is required. The program is designed to be completed in one calendar year by full-time students who 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. 41.
The College of Liberal Arts offers programs leading to eight advanced degrees: M.A., MACT, M.F.A., M Math, M Mus, M.P.A., M.S., and Ph.D. See page 9 for majors and degrees.

General Information

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

Anthropology

DEGREES

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:


Assistant Professors:

B. J. Howell, Ph.D. Kentucky; W. E. Klippel, Ph.D. Missouri.

Instructor:

M. A. Bass, (Part-time), Ph.D. Kansas State.

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 two-thirds of the courses must be at the 5000 level).
4. A thesis. In addition to the two (2) copies required by The Graduate School, one bound copy of the thesis is to be presented to the department and one bound copy to the student's thesis advisor.

THE DOCTORAL PROGRAM
Although there is no minimum credit hour requirement for the Ph.D. degree, students in this program should plan to devote to its attainment no less than 3 years beyond the B.A. level and to complete the following requirements:

1. Admission to Ph.D. program through passing Graduate Evaluation Examination at completion of first year of study, or through departmental acceptance of a previously earned M.A. degree in Anthropology.
2. Formation of an advisory committee and establishment in consultation with that committee of a program of study. Delineation of field(s) of competence by the student and committee and subsequent presentation to graduate advisor.
3. Demonstration of competence in a foreign language as determined by the student's committee.
4. Successful completion of oral and written comprehensive examinations and admission to candidacy.
5. Successful completion of the dissertation and final oral examination.

3170 Genetics and Society (3) (Same as Botany 3070.)
3410 Principles of Cultural Anthropology (3) Basic concept and objectives in study of culture. Range of cultural phenomena and approaches to its study. Recommended prereq: 2530. F or W
3440 Religion of Primitive Peoples (3) Religions of nonliterate peoples. Place of religion in their social and cultural systems. Recommended prereq: 2530. (Same as Religious Studies 3440.) F or Sp
3450 Community Studies in Complex Culture (3) Review of cross-cultural comparative urban and village communities and methodologies used in community studies. Recommended prereq: 2530. A
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. F
3540 North American Indian (3) An ethnographic
survey of cultures of Arctic, Southwest, Plains and Eastern Areas. Emphasis on cultural differences of people living in these areas during precontact period. Recommended prereq: 2550. F for Sp.

3555 Cherokee Ethnohistory (3) Survey of sociopolitical aspects of internal affairs and external relations of the 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 methodologies. Special emphasis on cultural differences and their influence on group behavior. Prereq: 2530 or consent of instructor.

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 I (3) Survey of prehistoric peoples north of Mexico from initial occupation to European contact. Recommended prereq: 2520. F

3611 Archaeology of United States and Canada II (3) Historic archaeology of Euro-American, Afro-American, and Asian cultures in United States and Canada from 15th to 20th centuries.

3620 European Prehistory I (3) Cultural developments during Paleolithic, Mesolithic, and Neolithic. Recommended prereq: 2520. W, A

3630 European Prehistory II (3) Cultural developments during Metal Ages. From the close of Neolithic through Iron Age. Recommended prereq: 2520. 3620 and 3630 should be taken in sequence. W, A

3560 Prehistory of Tennessee (3) History of archaeological research in Tennessee and surveys of prehistoric Indian cultures identified through research.

3780 Principles of Archaeology (3) Research strategies in archaeological excavation, interpretation, and explanation. Prereq: 2520 or consent of instructor. A

3700 Forms of Folklore (4) Introduction to the anthropological study of folklore.

3000 Language and Culture (3) Relationship between linguistic categories and patterns of culture. Prereq: 2540 or consent of instructor. Recommended prereq: 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

3920 Principles of Physical Anthropology (3) Survey of materials and methods in physical anthropol- ogy. Recommended prereq: 2510.

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) Peoples occupying these areas currently and their relationship to the prehistoric cultures in Northern Great Basin, Columbia Plateau, Northwest Plains, and Northwest Coast. Recommended prereq: 2520. A

4270 American Folklore (3) Anthropological perspectives of folklore of geographical regions and ethnic groups of the United States. Prereq: 3700 or consent of instructor.

4740 Southern Appalachian Folk Culture (3) Survey of settlement history and economic development of southern Appalachian area. Focus on historical and contemporary culture: technology and economics, social organization, beliefs and values, oral traditions, and customs. Prereq: Consent of instructor.

4741 Research in Southern Appalachian Folk Culture (3) Research-oriented, 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: 4740. May be repeated. Maximum 6 hrs.

4780 Italian Folklore (3) (Same as Italian 4780.)

4870 Cherokee Language (3) Linguistic survey of structure of the Cherokee language.

4930 Physical Growth and Constitution (3) Comparative growth patterns throughout the human life cycle. Sexual and racial differences in human growth and development. Prereq: 2510 or consent of instructor.

4940 Biology of Native Americans (3) American Indian origins and evolution from standpoint of skeletal remains and morphology and genetics of living populations. Emphasis on North American Indians. Prereq: 2510 or consent of instructor. A

4950 Primate Studies (3) Survey of field and laboratory investigations of comparative anatomy and non-human primate behavior. Prereq: 2510 or consent of instructor. F

4960 Primate Paleontology (3) Survey of fossil primate forms; origin and evolution of major primate lineages, emphasizing the earliest Hominids and related forms. Prereq: 2510. Recommended prereq: Zoology 4380. W


4975 Human Paleontology Laboratory (1) Detailed examination of casts and other materials pertinent to study of human paleontology. Prereq or coreq: 4970. Sp

5000 Thesis (1-15) P/NP only. E

5010 Graduate Research (1-9) Independent investigation of special problems in anthropology. May be repeated. Maximum 18 hrs. E.

5100 Seminar in Cultural Anthropology (3-9)

5101 Foreign Study (1-12) See page 96.

5102 Off-Campus Study (1-12) See page 96.

5103 Independent Study (1-12) See page 96.

5140 Seminar in Zooarchaeology (3) Approaches to analysis and interpretation of archaeological faunas. Intensive reading; evaluation and discussion of major faunal studies, general methods of faunal identification, and methods of presenting faunal data. May be repeated. Maximum 6 hrs. A

5149 Laboratory Studies of the Vertebrate Skeleton (4) Examination and comparison of skeletons of major groups of fish, amphibians, reptiles, birds, mammals. Oriented toward identification of archaeologically derived faunas. May be repeated. Maximum 12 hrs. A

5159 Laboratory Study of the Molluscs (4) Examination and identification of terrestrial and freshwater mollusks of eastern U.S. Emphasis on living and fossilized gastropods and pelecypods. Prereq: 4640. 1 hr and 3 labs. Sp, A.
5160 Seminar in Archaeology (3-9) Theoretical and practical issues central to contemporary archaeology. Prerequisite of instructor. May be repeated. Maximum 9 hrs.

5180 History of Thought in American Archaeology (3) Intensive review of continuity and change in concepts and methodologies; contributions of influential early and contemporary archaeologists. Prerequisite: 2520, 3810 and consent of instructor.

5200 Special Topics in Anthropology (3) Lecture and/or seminar course for advanced students on selected topics of current interest to field of anthropology as a whole. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs.

5210 Community Anthropology: The Local Community (3) Ethical issues, research methods and research methods on local community. Prerequisite: 4440 or consent of instructor. A

5340 Fieldwork in Archaeology (3-9) Practicum work surveying, excavating, processing, and analyzing of data; intensive reading. Prerequisite: 9 hours of introductory anthropology and consent of instructor. May be repeated. Maximum 9 hrs.

5400 History of Anthropological Theory (3) Theoretical contributions of more influential anthropologists. Prerequisite: Consent of instructor. A

5440 Peasant Societies (3) Critical analysis of existing literature and theories regarding rural-urban polarities, interactions, and different cultural manifestations of agricultural populations. Prerequisite: Consent of instructor. A

5450 Comparative Social Organization (3) Social structure in nonliterate societies. Kinship, age, sex, and economic factors in determining selec- tions between individuals and groups. Prerequisite: At least one area course A

5460 Quantitative Methods in Anthropology (3) Application of quantitative methods to anthropological studies of action and derivative procedures, distance analysis, discriminant analysis, and implementation of computer routines. Prerequisite: Statistics 2100 or equivalent. F

5470 The Healer in Cross-cultural Perspective (3) Graduate seminar dealing with socialization, methods of diagnosis, and therapeutic modes of healing in predominantly non-European-American milieu. Prerequisite: 4250. W

5510 Education In Cultural Perspective (3) Same as Curriculum and instruction 5516. F

5511 Non-Western Education: Anthropological Approaches (3) Analysis of traditional educational practices among non-Western peoples and problems from application of Western models of education among American Indian, African tribal groups and Asian cultures. (Same as Curriculum and instruction 5511.) W

5560 Theory in Archaeology (3) Review of development of archaeological theory. Coverage up to and including recent systems approaches. F

5610 Problems in North American Archaeology (3) Seminar to explore specific research problems in North American archaeology. Research topics on prehistoric ecology and settlement patterns in North America. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs. A

5620 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian and African prehistory investigated in depth. Prerequisite: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Classics 5520.)

5630 The Maya (3) Intensive survey of Mayan culture of Yucatan and Guatemala from pre-Columbian times to present. Prerequisite: 3580. A

5640 Archaeological Resource Management (3) Theory and practice—public, conservation, contract, and salvage/research archaeology. Legislation; contracts, responsibilities, and certification; agencies and policies; project design, administration, and logistics; standards of field work, analysis and publication; archaeology and public; conservation of archaeology as career. May be repeated. Maximum 6 hrs. W

5660 Seminar in Prehistoric Lithic Technology (3) Analysis of techniques employed in production of prehistoric lithic raw materials: raw materials utilized; resultant implements, morphology and function; and typological constructs utilized in archaeological analysis and interpretation. Prerequisite: Consent of instructor.

5670 Seminar on Aborigmal Lithic Resources (3) Training and research in stone materials utilized by prehistoric populations—properties, natural occurrence and geological context, relative abundance and quality extraction and distribution, processing and ultimate forms and functions. Theory and implement- ation of various techniques, discrete regions in terms of lithology and cultural homogeneity, particularly East and Middle Tennessee. Input from professional geologists, and field research. Recommended prerequisite: 5660.

5700 Theory in Folk Culture Studies (3) Seminar analyzing major theoretical viewpoints of European and American folklore and folk life study trends from inception to present. A

5710 Problems in Folk Culture Studies (3) Topical seminar dealing with selected problems and aspects of traditional behavior in Euro-American culture. Prerequisite: Consent of instructor. May be repeated. Maximum 6 hrs.

5900 Dental Anthropology (3) Dental anatomy, theories of dental evolution, genetic and environmental influences controlling dental morphology, comparative dental morphology, dental trauma, analyses, use of dentition for skeletal aging, and dental casting. Prerequisite: 3900. A

5910 Measurement of Man (3) Techniques of measuring and describing skeletal material and human subject with emphasis upon practical applications to growth, nutrition and human engineering. Prerequisite: Consent of instructor. A

5920 Advanced Physical Anthropology (3) intensive investigation of theory and problems in physical anthropology.

5930 The Human Skeleton in Forensic Medicine (3) Application of physical anthropology to problems in human identification. Determination of age, race, and sex of skeleton and preparation of reports for legal medicine. Prerequisite: 3900. Sp

5940 Skeletal Biology of Early Human Population (3) Practical and theoretical approaches to analysis of prehistoric human skeletal populations. Demography, vital statistics, pathology, nutrition, and measures of biological relationships as they relate to population as adaptive unit. Prerequisite: 3900. F

5945 Comparative Primate Anatomy (4) Laboratory-oriented course dealing with functional anatomy of primates: Musculoskeletal system and evolution of various primate adaptive patterns. Prerequisite: Osteology and one dissection course in zoology.

5950 Paleopathology (4) Identification and descriptive analysis of pathological conditions affecting human skeleton. Roentgenological, histological, and gross visual examination of skeletal material. Prerequisite: 3900 and/or consent of instructor. Lecture and lab.

5960 Dermatoglyphics (3) Methods of dero- matoglyphic analysis; genetics and psychology of variation of various dermatoglyphic elements; forensic applications; relationships to various genetic and chromosomal abnormalities. Prerequisite: Consent of instructor.

5970 Emergence and Early Evolution of Man (3) Ancestry and evolutionary significance of Australo- philinecrines. Prerequisite: 4970 or consent of instructor. W, A

5980 Neanderthal Man and Human Evolution (3) Morphology, distribution, and evolutionary relations- ships of Neanderthals. Prerequisite: 4970 or consent of instructor. W, A

5990 Human Variation (3) Nature of human biologic- al variation with emphasis on microevolutionary processes responsible for establishing and maintaining variation and relationship of variation to popula- tion structure. Prerequisite: 3900 or consent of instructor. A

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6410-20-30 Seminar in Cultural Anthropology (3, 3) Seminar is offered each quarter primarily for doctoral candidates.

6510 Selected Topics in Archaeology (3) May be repeated. Maximum 9 hrs.

6510 Selected Topics in Physical Anthropology (3) May be repeated. Maximum 9 hrs.

6970 Seminar in Human Paleontology (3) Prerequisite: 4970 or consent of instructor.

Archaeology—Greek and Roman See Classics

Art

MAJOR

DEGREES

Art

M.A., M.F.A.

Professors:


Associate Professors:


Assistant Professors:


Instructors:

L. Kocienski, M.A., California (Davis); T. Saupé, 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, printmaking, sculpture, and watercolor. One year of residence is required.

Curriculum:

Quarter

Thesis

3 hours

Area of concentration

12 hours

Drawing and composition

3 hours
The thesis is a critical essay relevant to the area of concentration. The M.A. 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, graphic design/illustration, 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.

Curriculum:

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Project in Lieu of Thesis</td>
<td>30</td>
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<tr>
<td>Major area</td>
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<tr>
<td>Art history</td>
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<tr>
<td>Electives</td>
<td>10</td>
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<tr>
<td>Seminar in Art Criticism</td>
<td>4</td>
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<tr>
<td>Seminar in Art History</td>
<td>4</td>
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<tr>
<td>Total</td>
<td>90</td>
</tr>
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</table>

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 an undergraduate Art History minor, or its equivalent, and reading knowledge of French, German, or Italian, unless waived by the art history faculty.

3518 Typography (4) Theories and techniques of typesetting and printing as fine art medium. Creative problems using type and letterpresses. May be repeated. Maximum 12 hrs.

3517 Airbrush (4) 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: manuscript illumination, mosaic, Romanesque pilgrimage church, Gothic cathedral. F

3705 Northern European Painting: 1350-1600 (4) From country art of late Middle Ages to Northern Renaissance. Van Eyck, Roger van der Weyden, Bosch, and Durer. Fall.

3715 Early Italian Renaissance Art: 1300-1450 (4) Development and exploration of naturalism. Revival of antiquity and development of theories of perspective 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

3725 Art of Southern Europe and New World, 1550-1830 (4) Tintoretto, El Greco, Caravaggio, Zurbaran, Velazquez, Bernini and Goya. Artistic relations between Iberia and Latin America. Sp

3726 The Art of Northern Europe 1550-1675 (4) Concentrated study of Bruegel, Rubens, Rembrandt, Georges de La Tour, Vermeer, Poussin and Hals. W


3728 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. F

3745 History of Modern Architecture in Europe and America (4) Survey of nineteenth-century styles, Sullivan and skyscraper. Twentieth century: Viennese leaders, the Bauhaus, Gropius, Van der Rohe, i.e. Corbusier, and Wright. Aalto to Kahn, Tange and Metabolism, Archigram, Soleri, and Venturi. F, W

3746 History of Modern Sculpture in Europe and America (4) From 1800 to Rodin. From 1900 to present: emphasis on Cubism, Constructivism, Expressionism, Assemblage, Pop, Primary Forms, Environments, and Earthworks. Sp

3763 Crafts in America (4) Craft movement; growth and development. Educational, social, economic, and aesthetic values. Role of designer in society as producer and teacher.

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

3767 Nineteenth-century American Painting (4) From West Point portrait to emergence of "The Eight." 1835-1900.

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.

4016 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

4265 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 non-majors. 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 Advanced Sculpture IV (4) Individual development of sculptural problems and techniques. Prereq: Consent of instructor. May be repeated. Maximum 16 hrs. E

4470 Advanced Wood Sculpture (4) Application of lamination, carving, and joining techniques in designing and construction of contemporary forms. Prereq: 3450 or consent of instructor. May be repeated. Maximum 12 hrs.

4506 Special Topics in Graphic Design/Illustration (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, construction, display and evaluation for two- and three-dimensional artists. Prereq: Senior or graduate standing or consent of instructor. Sp

545 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
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 being devoted primarily to formal course work and the last year to full-time research culminating in the doctoral dissertation.

Specific programs of study will be determined by the student in consultation with his/her faculty committee. In addition to the general Graduate School requirements, specific requirements for the 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 consist of a general knowledge of the basis 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 Appraisal 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: 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, Sp

4320 Introduction to Clinical Practice in Speech

Pathology (3) Prereq: 3040, 3050, 3310, 4040, and consent of instructor. (Same as Special Education 4320.) S/NC only. E

4330 Clinical Practice in Speech Pathology (1-6) Prereq: 4320 and consent of instructor. (Same as Special Education 4330.) E

4340 Clinical Practice in Speech Pathology (1-6) Prereq: 4330 and consent of instructor. (Same as Special Education 4340.) May be repeated. S/NC only. E

4400 Voice Disorders (4) Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 3040, 3065, or consent of instructor. (Same as Special Education 4400.)

4450 Clinical Practice in Audiology (1-6) Prereq: 4720 and 4930. E

4460 Clinical Practice in Audiology (1-6) Prereq: 4450, 4720 and 4930. E

4470 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 instructo. E

4550 Problems in Speech Pathology (1-6) Prereq: Consent of instructor. E

4560 Problems in Audiology (1-6) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

4610 Introduction to Language Pathology in Children (4) Nature, etiology and treatment of language retardation. Observation in language clinic is available. Prereq: 3040, 3200, or consent of instructor. F, Sp

4620 Birth Defect Syndrome 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 (1-6) Discussion and demonstration of various methods and procedures used in treating language retarded children. Prereq: 4610 or consent of instructor. F

4640 Parent Participation in Language Habilitation Programs (3) Nature of counseling and educational relationship 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

4660 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. E

4720 Audiology II (4) Basic principles of clinical audiology; pure-tone, speech, masking and overview of special auditory tests. Prereq: 3710. (Same as Special Education 4720.) W, Su


4930 Aural Rehabilitation: Speechreading and Auditory Training (3) 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. Recommended prereq: 4380 and 3050. (Same as Special Education 4940.) F, W, Su

5000 Thesis (1-15) P/NP only. 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 Advanced Clinical Practice in Audiology Study and Practice (1-6) Prereq: 4720 and 4930. May be repeated. Maximum 12 hrs. (Same as Special Education 5400.) E

5450 Practicum in Hearing Aid Orientation and Communication Counseling (1-6) Practical exposure to counseling hard of hearing and family members concerning use and expectations of hearing aids and suggestions for better use of communication skills. Prereq: 4720, 4930, and consent of instructor. May be repeated. Maximum 9 hrs. E

5500 Practicum in Verbo-Tonal Habilitation (1-6) Prereq: 4940, 5950, or consent of instructor. May be repeated. Maximum 9 hrs. E

5506 Neural Bases of Speech and Language (3) Structure and function of central and peripheral nervous systems, with emphasis on their role in speech and language. Prereq: 3065. F, W

5701 Anatomy and Physiology of Hearing (3) Structure of human ear, pathology of hearing impairment, and psychoacoustics of audition. Prereq: 3710. F

5701 Electrophysiological Assessment of Auditory Function (2) Techniques for electrophysiological measurement of auditory sensitivity, sound transmission by ear, distortion in ear, and ear as an alytc mechanism. Prereq: 4720, 5070 or consent of instructor. Sp, Su

5110 Comparative Anatomy of the Peripheral Auditory Structures (3) Tutor laboratory course in comparative anatomy of temporal bone employing microscopic dissection techniques. Prereq: 5070 or consent of instructor. E

5110 Introductory Research in Speech and Hearing (3) Analysis of research techniques, application of statistics, and completion of pilot research project. Prereq: Elementary statistics. F, W, Su

5117 Instrumentation in Audiology and Speech Pathology (3) Principles of instrumentation used in audiology and speech pathology. Prereq: 3010. W, Sp

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 problem 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 therapy and management of articulation disorders. Prereq: Undergraduate course in articulation disorders or consent of instructor. F, Sp

5230 Seminar: Voice Disorders (3) Current significant research in theory and management of voice disorders. Prereq: 4400 or consent of instructor. W, Sp

5300-320-40 Advanced Clinical Practice in Speech
and Language Disorders (1-6, 1-6, 1-6) Prereq: 4340 or equivalent and consent of instructor. 6340 may be repeated. Maximum 9 hrs. S/NC only. E

5340-60-70 Advanced Clinical Practice in Speech Diagnosis (1-6, 1-6, 1-6) Prereq: 4040, 4340 or equivalent. 5370 may be repeated. Maximum 9 hrs. S/NC only. E

5380 Cerebral Palsy (3) Neurological foundations and speech and language training. Prereq: 5060. (Same as Special Education 5390.) F

5381 Adult Dysarthria (3) Neuroromotor organization for speech production; types of adult dysarthria and associated neuromuscular symptomatolgy; 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 Special Education 5390.) W, Su


5450 Sound Measurement and Audiometer Calibration (3) Noise measuring systems and techniques; factors in military and industrial audiology, role of audiologist in industry. Prereq: Basic Acoustics or consent of instructor. W

5451 Noise and Audiology (3) Audiologist's role in noise-related activities: clinical, legal and consulting applications. Prereq: 5450 or consent of instructor.

5460 Advanced Audiometry (3) Theory and practice of advanced pure tone and speech audiometry; instrumentation and interpretation of audiometric findings with diagnostic differential. 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

5500 Seminar in Audiology (1-6) Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 15 hrs. F, Sp

5503 Special Auditory Tests (3) Theoretical and practical considerations of auditory procedures used for determining cochlear vs. retrocochlear auditory lesions, identifying central auditory lesions and nonorganic hearing loss. Prereq: 5460 S

5505 Special Problems in Audiology (1-6) Prereq: 4720 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 and treatment of retarded language development. 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, performance appraisal and clinical supervision. For audiologists and speech language pathologists interested in private practice, supervisory or administrative positions.

5600 Independent Study in Audiology (1-6) Special research, consultation, and research activities field of audiology. May be repeated. Maximum 6 hrs. E

5610 Practicum: Language Pathology in Children (3) Seminar and/or practicum involving discussion and utilization of testing tools and analyses of habilitative philosophies, specialties and techniques. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.

5651 Seminar in Language Differences (3) Significant research relevant to language difference of culturally different children. Prereq: 4650. Su

5730 Hearing Disorders (3) Advanced study of auditory disorders commonly encountered in medical environment. Etymology, pathology and evaluative procedures to differentiate lesions of auditory mechanism. Field trips may be required. Prereq: 4720 or equivalent and 5070. Su

5740 Pediatric Audiology (3) Advanced study of theoretical and practical considerations of procedures to evaluate hearing of infants and small children. Prereq: 4720 or equivalent. Sp

5750 Educational Audiology (3) Advanced case management of hearing impaired child; audiology follow-up; educational alternatives, teacher and parental counseling, social adjustment, classroom acoustics and state and federal guidelines. Prereq: 5040 and 5440.

5790 Seminar in Psycholinguistic Concepts in Speech Pathology (3) Psycholinguistic concepts and information theory in studying the normal acquisition of language and certain disorders of language. Prereq: Consent of instructor. (Same as Psychology 5790.) Sp

5930 Advanced Auditory Rehabilitation (3) Procedures and program, assessment of communicative functions and counseling strategies for hearing-impaired. Prereq: 4830. Sp

5950 The Verbo-Tonal System (3) Theory, procedures, and instrumentation of system in rehabilitation, habilitation, diagnosis, speech therapy, and foreign languages. Prereq: 3710. Recommended prerequisite: 3030, 4270, and 4630. F, W, Su

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6100 Experimental Phonetics (3) Acoustical and physiological analyses of speech production and perception. Prereq: 5119 or consent of instructor. F

6191 Experimental Phonetics Laboratory (2) Must be taken concurrently with 6100. Sp

6200 Psychoacoustics (3) Auditory reception and perception of nonspeech stimuli. Prereq: 6100. W

6290 Psychoacoustic Laboratory (2) Must be taken concurrently with 6100. Sp

6360 Applied Anatomy and Physiology of Speech Mechanism (3) Dissection and related readings. Prereq: 5060 or equivalent. Sp

6369 Laboratory in Applied Anatomy & Physiology of Speech Mechanism (2) Must be taken concurrently with 6360. Sp

6700 Experimental Techniques in Cochlear Physiology and Neurophysiology (3) Prereq: 5070 or equivalent. W, A

6800 Seminar in Speech Science (3) Advanced study of experimental areas such as speech physiology, acoustical analysis, recognition, perception and intelligibility of speech, communication theory, and psychological and experimental aspects 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

6890 Seminar in Hearing Science (3) Advanced study of perception and production of nonspetch acoustic signal, detectability, pitch, loudness, differential threshold, adaptation, and fatigue. Prereq: 6020 or consent of instructor. May be repeated. Maximum 9 hrs. W, A

6910 Research in Speech and Hearing (3) Analysis of experimental design in theses and dissertations. Psychological methods for data acquisition. Generation of experimental designs based on parametric and nonparametric statistics. Prereq: 5110 or equivalent and consent of instructor. S

6917 Theories of Hearing (3) Physiological process basic to classical theories of hearing related to sensitivity, loudness, pitch, and discrimination of acoustic stimuli. Prereq: 5117, 5119 or equivalent. Sp, A

6930 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

6950 Advanced Seminar in Audiology (3) Prereq: Consent of instructor. May be repeated. Sp

6952 Advanced Seminar in Speech and Language (3) Topics vary from quarter to quarter but include advanced study of aberrations of voice, articulation, speaking time and rhythm, language development or use, and language symbolization. Prereq: Consent of instructor. May be repeated. E

6960 Directed Research (1-6) Participation in ongoing or non-dissertational research. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. E

6970 Directed Study in Speech Pathology (1-3) May be repeated. Maximum 9 hrs. E

6980 Directed Study in Audiology (1-3) May be repeated. Maximum 9 hrs. E

6990 Directed Study in Speech Science (1-3) May be repeated. Maximum 9 hrs. E

6990 Directed Study in Hearing Science (1-3) May be repeated. Maximum 9 hrs. E

Biochemistry

MAJOR

DEGREES

Biochemistry

M.S., Ph.D.

Professors: W. D. Wickes (Head), Ph.D. Harvard; J. E. Churchill, Ph.D. Sheffield (England); G. J. Joshi, Ph.D. Poona (India); K. J. Monty, Ph.D. Rochester

Associate Professor: L. Huang, Ph.D. Michigan State.

Assistant Professors: L. B. Brattsten, Ph.D. Illinois; R. Bryant, Ph.D. Illinois; R. H. Feinberg, Ph.D. California (Berkeley); E. Frese, Ph.D. Virginia; 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 Ph.D. 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 at the end of the first year's condition, 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 MASTER'S PROGRAM

This program requires 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 pursuit of Ph.D. degrees.

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, 4250 and at least one special topics course (5450), or 5610 or 5110 or 5120 or 5310 or 5210.

4. A qualifying examination as described above.

5. At least 9 hours of advanced lecture-seminar courses 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 one year)*; at least one quarter of analytical chemistry, Chemistry 4510*, Introductory Physics*; Differential and Integral Calculus*; at least three quarters of approved advanced 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 advanced courses in biology (Biochemistry 4210-20-30, or Chemistry 4910-20 and Biochemistry 5120, 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 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 concerned 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 additional requirements for such a degree shall be:

a. The completion of at least 45 hours of approved course work for graduate credit, at least two-thirds 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.

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; enzyme behavior 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 one 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 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; activity and the Debye-Huckel model; electrochemistry; membrane permeability; 4220—Elements of statistical mechanics, diffusion; collision theory; chemical kinetics and transition state theory, higher order kinetics; specialized kinetics of enzymatic processes; some biopolymer considerations. Prereq: Mathematics 1840-50-60, Chemistry 3211-21-31 and 3219-29-39, and an introductory course in biology. F, W

4230 Introduction to Physical Biochemistry (3) Physical chemistry of macromolecules: polarized light, absorption and fluorescence, sedimentation and transport hydrodynamics; electrophoretic mobility, light scattering, ultracentrifugation, electrophoresis, crystallography of proteins and nucleic acids. Prereq: 4220 or Chemistry 5430, or equivalent. Sp

5000 Thesis (1-15) P/NP only. E

5910 Biochemical Techniques (2) Theory and laboratory techniques. Includes photographic and electrophoretic techniques in isolation and characterization of macromolecules of importance in biochemistry and molecular biology. Prereq: 4119 or equivalent. Open to undergraduates with consent of department.


5120 Biochemistry of Mitochondria and Selected Organelles (3) Organization of compartmentalized macromolecules involved in mitochondria and other cell organelles. Supramolecular organization, bioenergetics, transport systems, drug metabolism, oxygen toxicity and detoxification mechanisms, nitrogen fixation and photosynthesis, Enzymatic reactions, experimental approaches. Prereq: 4120 or 5510 or equivalent.

5130 Protein Structure and Enzyme Function (3) Physicochemical properties of proteins; primary, secondary, tertiary and quaternary structure; denaturation, renaturation and other conformational change; structure-function correlations; enzyme-specific models of catalysis; steady-state, transient, relaxation, and allosteric kinetics of catalysis. Prereq: 4110 and either 4220 or Chemistry 3450.

5210 Structure and Function of Biological Membranes (1) Structural organization of biological membrane components. Dynamic properties as studied by biophysical and bioelectrical. 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; cooling, supercooling, and other higher order structural considerations of collagen, DNA and RNAs; repair mechanisms, degree of lesion formation, and mechanisms of gene and 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; ribosome 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.

5310-30 Experimental Techniques (2, 2, 3) Tutorial laboratory course in modern experimental methods in biochemistry and molecular biology. May be repeated.

5510 Properties of Biomolecules Related to Function (3) Structures, chemical and physical properties of biomolecules. Relevant 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) Emphasis on the mechanisms of control and interaction of metabolic pathways and the mechanisms of energy demands of organism and on the physiological and physiological and homeostatic interactions of these pathways. Prereq: 5510 or consent of department. W

5530 Biosynthesis and Regulatory Functions of Informational Molecules (3) DNA, RNA, and Proteins; Roles in replication, transcription, translation and metabolic regulation. Prereq: 5520.

5610 Environmental Toxicology (3) Basic concepts in toxicology, its applications to subcellular, cellular, organ, organismal, and population, and environmental levels. Major emphasis on biochemical toxicology. Prereq: 4110-20, Chemistry 3211-21-31, 4910-20-30, or consent of instructor. (Same as Ecology 5610.) W

5640 Techniques in Environmental Toxicology (3) Survey of experimental techniques for assessment of presence, toxicity, and impacts of pollutants in global ecosystem. Laboratory exercises focus on analytical and bioanalytical methods as employed in toxicological studies. Prereq: Chemistry 3210-49, 3211-21-31, 3219-29-36. (Same as Ecology 5640.) Sp
6000 Doctoral Research and Dissertation (3-15) P/NP only. E
6010 Advanced Biochemistry Seminar (1) Topics to be covered posted in spring quarter for following year. Invited speakers of note will participate. May 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 chemistry. 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. (Same as Microbiology 6420.) S/NC only. F, W, Sp
6431 Advanced Special Topics (1-3) Registration only by prior arrangement with department. For students who have passed Ph.D. preliminary examination or in advanced state of graduate studies. They may be posted in advance. May be repeated. Maximum 9 hrs.

Biology
4510 Scientific Illustration (3) Introduction to design, production of graphs, charts for scientific illustration, planning of poster presentations and displays. No graphics background required. Prereq: Advanced standing in a science curriculum; consent of instructor.

Botany
MAJOR DEGREES
Botany M.S., Ph.D.
Associate Professors: C. C. Amundsen, Ph.D. Colorado; J. D. Caponetti, Ph.D. Harvard; A. S. Heilman, Ph.D. Ohio State; R. R. Herke, Ph.D. Miami (Ohio); L. G. Hickok, Ph.D. Massachusetts; K. W. Hughes, Ph.D. Utah; C. J. Schwartz, Ph.D. North Carolina State; H. H. Shugart, Ph.D. Georgia; W. O. Smith, Ph.D. Duke.
Assistant Professors: B. Mullin, Ph.D. North Carolina State; E. E. Schilling, Ph.D. Indiana; D. K. Smith, Ph.D. Tennessee.
The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, bryology, cytology, cytogenetics, ecology, genetics, lichenology, morphology, mycology, photobiology, physiology, phycology, pteridology, and taxonomy.
Requirements for admission: In addition to the general Graduate School requirements (see p. 10) the 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 if recommended; (4) college mathematics, 9 quarter hours.

General degree requirements are given on pages 18-21. 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. 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 a postgraduate 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.

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. *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 preparation 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.

*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, morphoanatomy, and development. Prereq: 6 hrs. in biological sciences. F, W
*3930 Field Botany (4) Study of plants in natural environments including plant identification, collection, preservation and basic ecological concepts. Prereq: 6 hrs in biological sciences. Sp, Su
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, morphogenesis, elements of metabolic processes, effects of age, light, natural rhythms, temperature and other environmental factors. Lecture and lab. Prereq: General chemistry and 1 yr. biological science. F, Sp, Su
4017 Field Mycology (3) Field experience on identification of higher fungi. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Su, A
4021 Field Bryology (3) Field experience on identification of mosses and liverworts. Frequent field trips, recognition of species and habitats, laboratory sessions. Prereq: 6 hrs of botany. Recommended prereq: 3010-20 or equivalent. Su, A
4022 Field Lichenology (3) Field experience identification of lichens. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Su, A
4023 Field Agrostology (3) Field experience on identification of grasses; morphology, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Su, A
4030 Mechanisms of Plant Speciation (3) Processes of plant speciation emphasizing population genetics, isolation, drift, hybridization, variation in 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. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Su, A
4050 Synantherology (3) Field experience on identification of compounds highly recommended. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: 3010-20 or equivalent. Su, A
4065 Identification of Woody Plants (3) Field identification of native trees, shrubs and woody vines of Southern Appalachians. Use of identification manuals, recognition of key characteristics, significant aspects of natural history of local species. Characterization of major woody plant communities of re-
5065 Phytoplankton Ecology (4) Interaction between environment and phytoplankton. Nutrient uptake, primary production, competition, ecological theory, energy flow, carbon cycle, and physiological adaptations by populations to environment. Prereq: 3010 or consent of instructor. F

5070 Principles of Biological Illustration (3) Principles and application of photography, including photomicrography and photomacrography, drawing graphics, and other methods for recording and presentation for research and publication of data in pictorial or graphic form. 1 hr and 2 labs. W

5080 Pteridology (4) Evolutionary study of lower vascular plants. Morphology, cytology, ecology, life cycles and classification. Biostatistical 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 phylogeny of tribes of grasses. Prereq: 3030 or consent of instructor. 2 hrs and 2 labs. F, 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

5210 Advanced Plant Physiology I (3) Plant cell metabolism: carbon, nitrogen and sulfur assimilation, respiration and biosynthesis of specialized plant products such as terpenoids, alkaloids and pigments. Prereq: Chemistry 3231. F

5220 Advanced Plant Physiology II (3) Photobiology, response of plants to light: photochemistry, photophysiology, and phychrome mediated responses. Water and solute uptake, loss, and movement; translocation; and fundamentals of mineral nutrition. Prereq: 5210 or Biochemistry 4120 and plant cell physiology course. Recommended prereq: 1 yr of physics. W

5225 Advanced Plant Physiology III (3) Growth and differentiation of plants at cellular and organismal levels. 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: 1 yr of physics. W

5250 Quaternary Problems (4) (Same as Geology 5250 and Zoology 5290.)

5310-20 Special Problems in Botany (1, 1, 1, 1, 1)

5340 Plant Geography (4) Distribution of ecosystems with emphasis on American types: vegetation, climatic and historical aspects. Prereq: 4310. 2 hrs and 2 labs. W

5350 Analysis of Plant Communities (4) Plants as species and ecosystems components considered from standpoint of genealogy, organization, and ecosystem function. Prereq: 4310. 2 hrs and 2 periods (field trips). S

5360 Marine Ecology (3) Relationships of marine organisms to environment and their interactions with each other. Trrophic relationships in neritic, coastal and estuarine ecosystems; succession; deep-sea ecology; stability. Prereq: One previous ecology course. W

5410-20 Seminar in the Teaching of College Botany (1, 1, 1) Objectives in teaching of general botany. Supervised teaching in general course; seminars in techniques, testing, concepts, and materials. Required of teaching assistants. Prereq: Consent of instructor. F

5540 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) Intensive consideration of cellular organization, structure and function, with emphasis on correlation where possible of ultrastructure, biochemistry and function of subcellular organelles. Principles and application of various analytical and electron microscopic techniques. Development of concept of cell fractionation and isolation of subcellular compartments; differentiation and analytical centrifugation; plant chromosomes, cytochemistry, and electron microscopy. Intended for graduate students in the biological sciences. 2 hrs and 2 labs. F, A

5810 Cytogenetics (4) Chromosome structure and behavior during mitotic and meiotic divisions in relation to structural, developmental, and evolutionary aspects. Roles of cell fractionation and isolation of subcellular components; differentiation and analytical centrifugation; plant chromosomes, cytochemistry, and electron microscopy. Intended for graduate students in the biological sciences. Sp, A

5820-21-22-23-24 Methods and instrumentation in laboratory investigations (1, 1, 1, 1, 1) Laboratory course providing project experience and theoretical background in various research methods, laboratory research techniques, safety rules, etc. May be repeated with consent of instructor. Maximum 12 hrs. S/NC only. E
Chemistry

MAJOR

DEGREES

Chemistry

M.S., Ph.D.

Professors:

G. Mamonov (Head), Ph.D. Louisiana State; J. E. Bloor, Ph.D. Manchester; N. S. Bowman, Ph.D. Pennsylvania; J. A. Buehler, Ph.D. Duquesne; T. Smith, Ph.D. Iowa State; M. J. Sepaniak, Ph.D. Illinois; M. J. Adcock, Ph.D. Louisiana State; J. L. Adcock, Ph.D. Berkeley; H. Lietzke, Ph.D. California (Berkeley); J. D. Kovacs, Ph.D. Yale; M. J. Sepaniak, Ph.D. Iowa State; C. Woods, Ph.D. North Carolina State.

Assistant Professors:

J. L. Adcock, Ph.D. Texas; S. D. Alexandratos, Ph.D. California (Berkeley); J. D. Kovacs, Ph.D. Yale; M. J. Sepaniak, Ph.D. Iowa State; C. Woods, Ph.D. North Carolina State.

Associate Professors:

F. A. Grimm, Ph.D. Cornell; J. F. Kinsale, Ph.D. Akron; C. A. Lane, Ph.D. California (Berkeley); L. J. Magid, Ph.D. Tennessee; F. M. Schell, Ph.D. Indiana.

A program leading to the Ph.D. degree with specialization in polymer science is conducted jointly with the Department of Chemical, Metallurgical, and Polymer Engineering, which offers a degree with similar specialization.

For the Ph.D. degree in 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. Participation in seminar (5911-21-31) during the entire period of graduate study.
3. Course and specialization requirements:
   a. 4160-70.
   b. Two of the following (except for polymer science):
      i. 5511, 5521, 5531.
      ii. For specialization in analytical chemistry, environmental chemistry, energy, inorganic chemistry, organic chemistry, polymer science, physical chemistry.
   c. For specialization in polymer science:
      i. 5531, 5540-70, 5610-20-30.
      ii. Two other courses from areas such as catalysis, heterogeneous equilibria, kinetics, resource management, nuclear technology.
4. A final oral examination.

THE DOCTORAL PROGRAM

The department offers specialization in seven areas for the M.S. degree: analytical chemistry, environmental chemistry, energy, inorganic chemistry, organic chemistry, polymer science, physical chemistry.

The program leading to the M.S. degree with specialization in polymer science is conducted jointly with the Department of Chemical, Metallurgical, and Polymer Engineering, which offers a degree with similar specialization.

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

1. Research and a thesis to give 9 to 18 hours of graduate credit (5000).
2. Participation in seminar (5911-21-31) during the entire period of graduate study.
3. Sufficient graduate course work in chemistry and/or a related field to make an overall total of 45 hours.
   a. 4160-70.
   b. Two of the following (except for polymer science):
      i. 5511, 5521, 5531.
      ii. For emphasis in polymer science, 5531, 5540-70.
   c. For emphasis in polymer science:
      i. 5531, 5140-50, Polymer Engineering 4810 and participation in the Polymer Seminar Program during the entire period of graduate study.
   d. For emphasis in environment, 5220, 5250-60-70, Ecology 5310, and Environmental Engineering 4030.
   e. For emphasis in energy, 5410, 5610-20-30, a chemistry sequence (5110-20-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810), Mechanical Engineering 4180; for polymer science:
      i. 5810.
      ii. For specialization in polymer science:
         i. 5810.
         ii. For polymer science:
            i. 5531, 5150-40, 5160 or 5170, Polymer Engineering 4910; 30 hours of additional graduate course work, including at least 6 hours at the 6000 level and at least 12 hours of chemistry courses; participation in the Polymer Seminar Program during the entire period of graduate study.
3. Graduate course work in related fields may be used for undesignated course work in this requirement upon approval of the student's faculty committee.

All course selections must be approved by the appropriate departmental committee.

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, physical chemistry, and theoretical chemistry.

The program in chemical physics is conducted jointly with the Physics Department which offers a similar degree.

A comprehensive advanced examination in the field of specialization.

5. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.
6. A final oral examination.

Alumni Distinguished Service Professor.

College of Liberal Arts/Chemistry

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6111 Selected Topics in Organic Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6130 Natural Product Chemistry (3) Structure, chemistry, and application of naturally occurring substances of biological or environmental significance. Course content may vary with each offering to reflect areas of current chemical interest. Prereq: Two of 5110-20-30-35.


6190 Organometallic Chemistry (3) Structure, bonding and synthesis of organometallic reagents. Application to problems in organic synthesis. Prereq: Two of 5110-20-30-35.

6210 Advanced Analytical Spectroscopy (3) Newer methods of spectroscopic analysis, including: transform methods, lasers in spectroscopy, fiber optics, introductory nonlinear optics, and spectroscopic techniques for remote sensing. Prereq: 5250.

6211 Selected Topics in Analytical Chemistry (3) Subject matter varies among important topics of current significance: theory and practice of spectroscopy, electrochemistry, mass spectrometry, microwave spectroscopy, and microprocessor applications in chemical instrumentation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6311 Selected Topics in Polymer Chemistry (3) Subject matter varies among important topics of current significance. Prereq: 5410-50. May be repeated. A

6320 Natural Polymers (3) Structure, modification, and nonbiochemical utilization of natural polymers and polymers derived from naturally-occurring monomers. Prereq: 5140 or two of 5110-20-30-35.

6411 Selected Topics in Physical and Theoretical Chemistry (3) Subject matter varies among important topics of current significance. Prereq: Two of 5410-50-50. May be repeated. A

6420 Nuclear Magnetic Resonance (3) Theory of nuclear magnetic resonance spectroscopy with emphasis on high-resolution methods. Applications to problems in stereochemistry and structure. Prereq: Two of 5110-20-30-35.

6430 Photochemistry and Radiation Chemistry (3) Fundamental physical and chemical processes pertaining to excitation of molecules by photons and electrons; multiphoton processes and uses of laser sources; fluorescence and phosphorescence; radiationless transitions as studied by optoacoustic spectroscopy; chemical reactivity of excited states; ion-molecule and free radical reactions; electron capture and electron-transfer processes. Prereq: 5430.

6450 Electrochemistry (3) Electrical double layer; electrode processes of transport properties of electrolytes; electroanalytical methods. Prereq: 5430 or 5270.

6475 Electronic Structure of Radicals (3) Applications of electron spin resonance to study of molecular conformation, structure, and bonding in organic and inorganic radicals; comparison of experimental results with theoretical predictions based on Walsh rules and on INDO molecular orbital calculations. Prereq: 5340-50 and 6520.

6480 Statistical Thermodynamics (3) Application of statistical mechanical methods to systems of chemical interest such as solute effects on equilibrium and rate processes, phase equilibrium, condensation phenomena. Prereq: 5410, 5450.

6495 Advanced Chemical Kinetics (3) Mechanism of elementary chemical reactions at molecular level including topics such as dynamics of molecular collisions, potential-energy surfaces, reaction cross-sections, 'direct' vs 'complex' modes of reaction, photofragmentation, energy partitioning and transfer, chemiluminescence, and chemical lasers. Prereq: 5430.

6510 Thermodynamics of Solutions (3) Theory of regular and nonregular solution behavior; measurement of activity coefficients and other thermodynamic properties; selected topics from literature. Prereq: 5410.

6520 Magnetic Resonance (3) Principles of magnetic resonance spectroscopy underlying nuclear magnetic resonance and electron spin resonance. Chemical applications to solid and liquid systems. Prereq: 5340.

6711 Selected Topics in Inorganic Chemistry (3) Subject matter varies among important topics of current significance: photoelectron spectroscopy, transuranium, organometallic compounds, organic solution kinetics and mechanisms, crystal chemistry, nonaqueous chemistry, chemistry of halogens and compounds. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A


6750 Molten Salt Chemistry (3) Structure, spectroscopic properties, solution thermodynamics, electrochemistry and phase equilibria of molten salts. Solutions of metals in molten salts. Prereq: 5110 or 5410 or equivalent.

6810 Vibrational Problems in Molecular Spectra (3) (Same as Physics 6810.)

6811 Selected Topics in Nuclear Chemistry (3) Subject matter varies among important topics of current significance: nuclear decay schemes, nuclear models, nuclear reaction theory, nuclear detection techniques, activation analysis. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

6820 Molecular Vibration-Rotation Theory (3) (Same as Physics 6820.)

Classics

Professors:
H. C. Flitridge (Head), Ph.D. Ohio State; A. Rago (Emeritus), Ph.D. Illinois.

Associate Professors:
G. C. Gesell, Ph.D. North Carolina; J. E. Sheflon, Ph.D. Vanderbilt.

Assistant Professors:
C. P. Craig, Ph.D. North Carolina; S. D. Martin, Ph.D. Michigan; D. W. Tandy, Ph.D. Yale.

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

Greek

3010 Plato (3) A

3020 Herodotus (3) A

3030 Euripides (2) A

4020 Aeschylus, Sophocles (3) A

4030 Lysias (3) A

4040 Aristophanes (3) A


Latin

3440 Livy (3) A

3450 Pliny and Martial (3) A

3450 Eliacies Poets (3) A

3470 Selected Readings from Latin Literature (3, 3) May be repeated. A; A

3480 Horace, Odes (3) A

3450 Tacitus (3) A

3460 Lucretius (3) A

3470 Readings in Medieval Latin (3) A

5410-20-30 The Latin Epic: Lucretius, Vergili, Lucan (3, 3, 3) A; A

5510-20-30 Roman Comedy; Plautus, Terence (3, 3, 3) A; A; A

GENERAL COURSES

3210 Early Greek Mythology (3) Comprehensive study of Greek myths through readings, lectures, and discussion with emphasis on significance for Greek thought and religion. Slides and tapes illustrate influence of Greek myths on art, music, and literature of ancient Greek and later cultures. (Same as Religious Studies 3210.) F

3220 Greek Mythology in the Classical Period (3) A study of use of myth in literature, history, religion, philosophy, and art of Classical Age of Greece, and change of attitude toward myth from earlier periods. Familiarity with basic Greek myths is assumed. Readings, lectures, slide (3) and discussion. (Same as Religious Studies 3220.) W

3230 Roman Mythology (3) Study of myths created by Romans, as well as those the Romans borrowed from the Greeks, with reference to Roman attitude toward history, religion, and society. Readings, lectures, slides, and discussion. (Same as Religious Studies 3230.) Sp

3310 Art and Archaeology of the Aegean Bronze Age and Early Greece (3) Troy, the Cyclades islands, Greece 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. F

3320 Art and Archaeology of Archaic and Classical Greece (3) Survey of development of Greek architecture, sculpture, and painting from 650 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
ENTRANCE REQUIREMENTS TO M.S. PROGRAM
Upon admission to The Graduate School, students who wish to enter the Master's degree program in Computer Science should have the following background:
1. Mathematical maturity at least equivalent to that of a student who has completed one year of multivariable calculus and matrix algebra.

2. Computer Science 3155 or an equivalent introductory numerical algorithms course.
3. An introduction to probability and statistics at least at the level of Statistics 3450.
4. Computer Science 2215 or an equivalent introduction to abstract structures and logical foundations of computer science.
5. Computer Science 2610, 2710 and 3520 or equivalent courses in advanced programming, machine organization and assembler language programming.

THE MASTER’S PROGRAM
All students must receive departmental credit for or exhibit proficiency in the following courses:
1. Computer Science 4510, 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 above. These must include at least 18 hours at the 5000 level in addition to the 5000 level courses explicitly required for the degree.
2. Complete at least 9 additional hours of thesis credit, Computer Science 5000.
3. Pass an oral examination by a committee of at least three faculty members.

Plan B: Non-Thesis Option
1. Complete 36 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 explicitly required for the degree.
2. Pass written and oral comprehensive examinations.

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 2860. (Same as Mathematics 3150.) E

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 or coreq: Mathematics 2860. (Same as Mathematics 3155.) E


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, monoids. Prereq: 2215 or equivalent. (Same as Mathematics 3725.) W

4050 Number Systems for Digital Computers (3) Floating-point number representation, mixed-radix 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. W


4225 Numerical Solutions to Equations and Numerical Approximations (3) (Same as Mathematics 4225.) F, W

4235 Numerical Methods for Ordinary Differential Equations (3) (Same as Mathematics 4235.) F, Sp

4310 Statistical Data Processing (3) FORTRAN language for organization and analysis of statistical data. SPSS and SAS programs for standard statistical analyses; frequency distributions, percentiles, contingency tables, 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 concepts and methodology. Use of StatPack, edit programs, and FORTRAN. Not for credit for computer science majors. Prereq: Statistics 2100 or equivalent and 4310 or knowledge of a procedure-oriented language such as FORTRAN.

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 SIMPAC, APL or SIMULA. Prereq: 4510.

4510 Data Structures and Non-Numeric Programming (3) Data structures and algorithms for their manipulation. Arrays, and ordinal lists; stacks, queues, rings, doubly-linked lists, trees, dynamic storage allocation; organization of files; program languages for information structures. Prereq: 1025 and 2610.

4550 Systems Programming (3) Computer organization and operating system programming. Machine language and design of computers, representation of information, microprogramming, software systems, input/output systems, interpreters, macro assemblers. 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 definition and data manipulation languages. Data independence. Implementation and operational considerations; performance, integrity, security, and reliability. Prereq: 4510 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 system concepts, processor, device and data management, interrupts, machine-level input/output, loaders and relocation, device characteristics, device set organization, BIPOLAR. Students may not receive credit for both 4610 and 5670. F

4620 Operating Systems—Case Studies (3) Alternatives in operating system design, dynamic re-location, paging, segmentation, time sharing, time slicing, protection, concurrency, real time systems. Examples from different systems design, as appropriate. Prereq: 4610 or equivalent or consent of instructor. W
4860 Principles of Compiler Design (3) Techniques of compiler design, scanning and parsing of languages described by regular and context-free grammars. Prereq: 4510.


4750 Interactive Computer Graphics (3) Point plotting vector generation, interactive graphical techniques, two- and three-dimensional transformation, 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) Design of computer systems; implementation, justification, personnel in systems; perspective on systems. Prereq: 3520 or equivalent.

4980 Special Topics in Computer Science (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) P/NP only. 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 Computer-Assisted Instruction (3) History and development of CAI systems. Emphasis on studying success and failure of major projects, future role of AI in CAI. Use of a CAI programming language to implement a CAI course. Prereq: Programming experience or consent of instructor.

5050 Computer Modeling 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 spatial relationships. Prereq: 3510 or 3515, and 3520 and Statistics 3450. A

5100 Immigration to Computer Science (3) Designed for graduate students with limited computer science background who wish to enter computer science major or minor program. Advanced programming techniques, input/output devices; machine organization and assembly language programming; introduction to data structures and algorithm analysis. Prereq: One course in programming.

5109 Immigration to Computer Science Practicum (2) Design and implementation of medium to large-scale computer programs. Coreq: 5100.

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. General introduction to field of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5690.) W

5250 Medical Computing (3) Achievements and problems in medical computing; computer technology to field of health care. Various areas of medical computing; laboratory data systems, patient monitoring systems, diagnostic devices, patient records, automatic history taking, and hospital administration systems. Prereq: 4510. Sp

5430 Advanced Compiler Design (3) Design and implementation of compilers, affix and two-level grammars, compiler-compilers, incremental compilation, run-time organization, data flow analysis, optimization, and error recovery. Prereq: 4680 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 DBMS area. Prereq: 4510 and 4550 or consent of instructor. W

5585-65-75 Numerical Mathematics (3, 3, 3) (Same as Mathematics 5565-65-75.) F, W, Sp

5650-60-70 Advanced Operating Systems (3, 3) Theory and analysis of operating systems. Synchronization and deadlock analysis. Analysis of operating systems using mathematical models, simulation, and hardware and software monitors. Comparison of good heuristic scheduling algorithms with best possible schedulable; scheduling anomalies. Case studies of virtual memory systems. Analysis of page swapping and placement strategies. Prereq: 4610 or equivalent or consent of instructor. F, W


5730 Computability and Computational Complexity (3) Computability and decidability; Turing machines and Turing machine hierarchies. Recursive and recursively enumerable sets; partial recursive functions. Time and space bounded computations; the P vs NP problems. Prereq: 4710. A

5750 Theory of Formal Languages (3) Phrasestructure languages, their generators and processes. Types 0, 1, 2 and 3 languages; operations on languages and grammars; deterministic context-free languages. Theory of translation. Prereq: 4710. W

5775 Combinatorial Algorithms (3) Algorithms for solving optimization problems in graphs, networks and matroids. Precise notions of time and space complexity. Prereq: 4730. (Same as Mathematics 5775.) A

5810 Information Organization and Retrieval (3) Organization, storage, searching and retrieval of information. Development of IR systems from off-line to modern on-line operations. Information analysis and dictionary construction and operations. Search and matching procedures; retrieval process. Information dissemination systems. Data base retrieval systems. Prereq: 4510 or 4550. F


5880 Data Security (3) Need for security and methods for achieving it; encryption, machine architecture, hardware and software implementation, historical and current approaches. Case studies in fraud and misuse. Prereq: 3520 or consent of instructor.

5910-20-30 Special Topics in Computer Science (1-5, 1-5, 1-5) May be repeated. Maximum 9 hrs.

5940-50 Advanced Small Computer Systems (3, 3) (Same as Electrical Engineering 5940-50.)

5970 Independent Study in Computer Science (1-3) Special project under faculty guidance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

Cultural Studies

Asian Studies

3670 Islamic Literature in English Translation (4) Survey from origins to modern period of major Islamic literatures, especially Arabic, Persian and Turkish. Readings include The Arabian Knights, The Rubaiyat of Omar Khayyam and Gibran's The Prophet.

4010-20-30 Readings in Asian Literature (4, 4, 4) Prereq: Mastery of intermediate level of Japanese, Chinese, Sanskrit, or Arabic and consent of instructor. 4012 Selected Topics in Asian Studies (4) Content varies. May be repeated. Maximum 12 hrs.

4631-32-33 Advanced Chinese (4, 4, 4) Taped language program. Prereq: 3531-32 or equivalent or consent of instructor. Must be taken in sequence.


Afro-American Studies

3140-50-60 Directed Readings in Afro-American Studies (1, 1, 1) Designed for students who are interested in doing intensive reading in some area of Afro-American Studies which is defined by the student and the instructor. Prereq: 2010 or 2020 and consent of instructor.

4200 Senior Seminar on Pan-Africanism (4) Explores concepts and philosophers of Pan-Africanism and implication of this ideology for various societal institutions.

4300 Resource Materials in Afro-American Studies (4) Basic references such as bibliographies, indexes, and listings of audiovisuals in Afro-American history, African history, and children's literature. Prereq: 2010 or 2020 or consent of instructor.

4310 Research in Afro-American Studies (4) Deals with Black experience and research process.

4500 Issues and Topics in Afro-American Studies (4) (Same as Political Science 4500.) Designed for students who are interested in doing intensive reading in some area of Afro-American Studies which is defined by the student and the instructor. Prereq: 2010 or 2020 or consent of instructor.

4880 Afro-American Psychology (4) (Same as Psychology 4880.)
Comparative Literature
4012-22-32 Special Topics in Comparative Literature (3, 3, 3) Content varies; may be repeated. F, W, Sp
4050-60-70 Dante and Medieval Culture (3, 3, 3) Same as Italian 4050-60-70. A, A, A
5032 Studies in Comparative Literature (3) Independent research problems. Prereq: 5012 and 5022. Sp

Cultural Studies
5101 Foreign Study (1-12) See page 96.
5102 Off-Campus Study (1-12) See page 96.
5103 Independent Study (1-12) See page 96.

Linguistics
4000 Topics in Linguistics (3) Content varies. May be repeated. Maximum 9 hrs.
4020-30 Historical Linguistics, Neogrammarians, School, and Growth of Structuralism (3, 3) 4020—Traces development of scientific approach to linguistics from Jacob Grimm and Franz Bopp through nineteenth century. 4030—Traces change in linguistic interest brought about by Saussure's Coorset and Cultural Studies. 4040—Independent research problems. Prereq: 5012 and 3000, or equivalent. W
5022 Approaches in Comparative Literature (3) French and American schools; "comparative literature" vs "general literature"; Van Tiegham, Carre, Baudensperger, Wellex. Prereq: 5012; completion of three literature courses in foreign language above 3000, or equivalent. W
5032 Studies in Comparative Literature (3) Independent research problems. Prereq: 5012 and 5022. Sp

Women's Studies
4830 Afro-American Women in American Society (3) (Same as Afro-American Studies 4830.)
5110 Psychology of Women (3) (Same as Educational and Counseling Psychology 5110.)

Economics
See College of Business Administration.

English
MAJOR
English DEGREES
English M.A., MACT, Ph.D.
Professors:

Associate Professors:
J. M. Armitstead, Ph.D. Duke; L. H. Burghardt, Ph.D. Chicago; D. A. Carroll, Ph.D. North Carolina; D. R. Cox, Ph.D. Missouri; B. K. Dumas, Ph.D. Arkansas; D. F. Goslee, Ph.D. Yale; N. M. Goslee, Ph.D. Yale; D. M. Hall, Ph.D. North Carolina; T. J. A. Heffernan, Ph.D. Cambridge, M.A. LoPolo, Ph.D. Maryland; C. J. Maland, Ph.D. Michigan; M. L. Pryse, Ph.D. Califomia (Santa Cruz); M. P. Richards, Ph.D. Wisconsin; F. K. Robinson, Ph.D. Texas.

Assistant Professors:
K. Adams, Ph.D. Florida State; G. Hutchinson, M.A. Indiana; M. Kellel, Ph.D. Rutgers; M. Keene, Ph.D. Texas; I. Leki, Ph.D. Illinois; M. Newfield, M.A. Cornell; R. Stilman, Ph.D. Pennsylvania; S. Watt, Ph.D. Illinois.

Visiting Lecturer:
W. Dykeman, B.A., Northwestern.

Literature
Detailed information about the Master's and doctoral programs, and about individual graduate options, may be obtained by writing the Director of Graduate Studies of English, McClung Tower. For admission forms, write to the Graduate School.

THE MASTER'S PROGRAM
The departmental requirements for the M.A. degree in English include (1) thesis and 36 quarter hours of courses in the Department of English or 45 quarter hours without a thesis, (2) evidence of proficiency in one foreign language, and (3) a final examination. The courses should include 12 hours at the 6000 level, 12-21 hours of additional courses at the 5000-6000 level, and 12 hours at any level for graduate credit, including the 3000-4000 level. The M.A. with Writing Option is intended for those students who plan to do free-lance writing, specialize in teaching writing courses at the college level, or work as professional writers in business or industry. Students who go on to complete the Ph.D. may also find the M.A. with Writing Option helpful when they are seeking teaching positions.

1. A minimum of 36 quarter hours beyond the B.A. degree.
   a. 12 hours at the 6000 level.
   b. 12 additional hours at the 5000-6000 level. (A student may take only 3 hours of 5103 Independent Study toward the degree.)
   c. 12 hours for graduate credit at any level, including the 3000-4000 level.

2. Students in the M.A. with Writing Option program may choose one of the following writing projects:
   a. A thesis, using research to analyze some aspect of writing or rhetorical theory, for which 9 hours credit is given. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his/her project director.
   b. A creative project, for which 9 quarter hours of credit is given. A collection of poems or short stories, a novel, a play, or a creative work of non-fiction prose would be acceptable as creative projects. The nature and length of each project will be determined by the Director of Graduate Studies after consulting with the student and his/her project director.
   c. A final examination. A candidate presenting a thesis or creative project must pass a one-hour oral examination, consisting chiefly of questions covering the general history and interpretation of English and American literature, not merely the courses which he/she has taken. A reading list of primary works designed to help the M.A. with Writing Option student prepare for these questions is available in the Office of the Director of Graduate Studies in English. This reading list may be modified by the M.A. examining committee, meeting in a body with the student, to reflect the candidate's particular writing interests. The nature of the oral examination should focus upon the literature outlined in the original reading list.
   d. Evidence of proficiency in one foreign language, to be fulfilled in one of the following ways:
      a. The completion of a second year of language at college level with a grade of C or better.
      b. The completion of French 3202 or German 3202 at UTK with a grade of B or better.
      c. The passing of the regular Ph.D. language examination as currently administered at UTK.

The departmental requirements for the Ph.D. degree in English is completion of a minimum of three academic years of resident graduate study. This includes a balanced program of at least 72 quarter hours (or the equivalent) in English: 36 hours at the 6000 level; 24 additional hours at the 5000-6000 level; 12 hours for graduate credit at any level, including the 3000-4000 level. In addition, 9 (or 6) hours approved by the department must be taken for graduate credit in a subject other than English. Normally a student with the M.A. from another university must transfer at least 24 quarter hours (or the equivalent) in 4000-level courses.

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.

1211 Written and Oral English for Foreign Students (6) Rapid review of English grammar structures and pronunciation with intensive oral, aural, 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 (6) Emphasis on the 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 English 1211. A, B, C, I, F, W grading. Students registered for this course are permitted to register for only 2 other courses.

3070 Modern British Poetry (3) From Howman to Thomas and more recent poets.

3080 Modern American Poetry (3) From Robinson to Stevens and more recent poets.


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 landscape painting in politics, science, religion, and the arts. 3210—1800 to 1835. 3220—1835 to 1890. F; W; Sp


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. A

3610 Restoration and Eighteenth-century Poetry (3) Emphasis upon Dryden and Pope.

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 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 North American materials: folk tale, folksong, myth, legend, proverbs, riddles, superstitions, dance, games, and architecture. A

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) Prose, Joyce, and modernists. A

4010-20 Shakespeare (3, 3) 4010—Early plays, c. 1590-1601, including Henry IV, Twelfth Night, and Hamlet. 4020—Later plays, 1601-1613, with emphasis upon tragedies and dramatic romances.

4042-43 Topics in Mode and Genre (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 approaches 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, and Kennedy, and major figures to 1870. 4060—Henry James and Mark Twain through early works of Faulkner and Hemingway. 4070—Early thirty to present. F; W; Sp

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 of 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 basic Writing Fiction course. Prerequisite: 3450 or consent of instructor.

4254 Writing the Detective and Mystery Story (3) Instruction and writing cover entire crime field—suspense, police procedural, private eye, spy, and adventure fiction. Recommended prerequisite: 3450-70-80 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 techniques learned in basic Writing Fiction course.

4270 Advanced Poetry Writing (3) Further development of skills acquired in basic Writing Poetry course. Prerequisite: 3410-30-40. F; W; Sp


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. Prerequisite: 3330 or consent of instructor. (Same as Linguistics 4440.)

4450 Dielectogy (3) Theories and methodologies of dialect research, fieldwork, and analysis. Prerequisite: 3340 or consent of instructor. (Same as Linguistics 4450.)

4455 Variegated of English (3) Theories, methodologies, and findings of English and American dialectology with emphasis on implications for cultural pluralism. Prerequisite: 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, and lexical) between English and another language. Prerequisite: Second year of a foreign language. 4481—Materials and methods of language teaching, with emphasis on preparation of materials and structured teaching situations. Theory of testing language competence and performance, with emphasis on construction of tests. Taught with an experienced member of the staff. Prerequisite: 4471. (Same as Linguistics 4471-81) W; Sp

4510-20-30 Black Literature (3, 3, 3) Trends and developments.

4561 Southern Literature through the Nineteenth Century (3) Southern writing from colonial period to end of nineteenth century, including frontier humorists and local color writers.

4562 Southern Literature in the Twentieth Century (3) Modern Southern literary renaissance, the Fugitives and Agrarians, Faulkner and more recent writers such as Welty, O'Connor, and Porter.

4560 Emerson and Thoreau (3)

4580 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 folklore; 4741—The folk narrative; functions, categories, and patterns of storytelling.

4840 Milton (3) Emphasis on major poems.

4860 Seventeenth-century Prose and Poetry (3) Bacon and Donne to Marvell.

4930-40 Chaucer (3, 3) 4930—The Canterbury Tales. 4940—Troilus and Cressidey and early poems.

5000 Thesis (1-15) P/NP only. 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 96.

5102 Off-Campus Study (1-12) See page 96.

5103 Independent Study (1-12) See page 96.

5140 Teaching Freshman Composition (3) Introduction to teaching of Freshman English through study of various techniques and philosophies of composition. Required of all first-year teaching assistants.

5150 Old English Prose (3)

5170-80 History of the English Language (3, 3) 5170—Historical linguistics, Old English, development of inflection and word order, 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; W; A; Sp; A

5240 Readings in Black American Literature (3) Critical analysis of poetry, prose, drama, criticism; historical and cultural background; discussion of relevance or irrelevance of race as influence on text and reader.

5250 Fiction Writing (3) Advanced fiction projects, under supervision of instructor and time for independent study. Prerequisite: Extensive background in reading and writing fiction.

5255 Writing of Advanced Non-Fiction Prose: The Genres (3) Practice in writing of biography, travel book, historical study, and associated genres. Viewpoint is creative. Prerequisite: 4000-level writing course or consent of instructor.

5270 Poetry Writing (3) Major poetic project or concentration. Project begun in 4270. Individual consultation with instructor supplements class analysis; readings in contemporary poetry and theory. Prerequisite: 4270 or consent of instructor.

5280 Special Topics in Writing (1-3) Topic varies.
5290 Analysis of Technical Writing (3) Theory and practice of technical writing. Exploration of current theories of scientific, business, technical, academic, and government rhetoric. Analysis of shared elements and practice in producing such writing. Pre-req: consent of instructor.

5310 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.

5410-20-30 Studies in Middle English (3, 3, 3)
5410 Old English Poetry (3) Pre-req: 5420, 5520.
5420 Beowulf (3) Prereq: 5410.

5510-20 Readings in Literary Criticism from Plato to Aristotle to the Present Day (3, 3)
5510 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.
5520 Theories of Scientific, Business, Technical, Academic, and Government Rhetoric (3, 3)
5530 Rhetoric and Composition: History and Theory (3) Modern developments in rhetorical theory, their origins in Plato, Aristotle, and others.

5610-20-30 Studies in Colonial American Literature (3, 3, 3)
5610-20-30 Studies in American Fiction (3, 3)

5710-20-30 Studies in English Literature of the Eighteenth Century (3, 3, 3)
5710-20-30 Studies in Eighteenth-century Literature (3, 3, 3)
5720-30 Studies in English Literature of the Renaissance (3, 3, 3)

5810-20-30 Readings in English Literature of the Eighteenth Century (3, 3, 3)
5810-20-30 Readings in English Literature of the Nineteenth Century (3, 3, 3)
5910-20-30 Readings in English and American Literature of the Twentieth Century (3, 3, 3)

6000 Doctoral Research and Dissertation (3, 3, 3) P/NP only. E

6100-20-30 Studies in Middle English (3, 3, 3)
6100 Old English Poetry (3) Pre-req: 5150.
6100 Beowulf (3) Pre-req: 5150, 6150.
6170 Studies in Middle English (3)

6181-82-83 Studies in English Language (3, 3, 3)
6210-20-30 Studies in American Literature (3, 3, 3)
6241-42 Studies in Colonial American Literature (3, 3, 3) Pre-req: 5241. From Thomas Hariot through Increase and Cotton Mather. 6243—From Jonathan Edwards to adoption of Constitution. A

6270-80 Studies in American Fiction (3, 3)
6310-20-30 Studies in Victorian Literature (3, 3, 3)
6410-20-30 Studies in Chaucer (3, 3, 3)
6510-20-30 Studies in Spenser and Milton (3, 3, 3)

6550 Studies in Mode and Genre (3) Content varies. May treat drama, novel, short story, poetry, or satire, the comic, the tragic, etc., depending on purpose.

6590 Special Topics (3) Content varies. Humor, history of ideas, biography, autobiography, literature of travel, literature and extra-literary disciplines, etc.

6610-20-30 Studies in English Romanticism (3, 3, 3)
6710-20-30 Studies in Eighteenth-century Literature (3, 3, 3)
6810-20-30 Studies in Drama and Theatre (3, 3, 3)
6860 Textual Bibliography and Criticism (3) Study of evidence gathered from printing process to make critical judgements about text of literary work. Pre-req: 5860 or consent of instructor.

6910-20-30 Studies in Twentieth-century Literature (3, 3, 3)

French
See Romance Languages

Geography
MAJOR

DEGREES

Geography
M.S., Ph.D.

Professors:
T. R. Jumper (Head), Ph.D. Tennessee; C. Aiken, Ph.D. Georgia; E. H. Hammond, Ph.D. California (Berkeley); C. W. Minkel, Ph.D. Syracuse; T. H. Schmidde, Ph.D. Wisconsin.

Associate Professors:
T. L. Bell, Ph.D. Iowa; L. W. Brinkman, Jr., Ph.D. Virginia; G. T. Paludan, Ph.D. Denver (UT Space Institute); B. Radston, Ph.D. Northwestern; J. B. Reider, Ph.D. Louisiana State.

Assistant Professors:
T. J. Blasing (Adjunct), Ph.D. Wisconsin; R. Forrest, Ph.D. Rutgers; L. Pulsipher, Ph.D. Southern Illinois.

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, urban geography, geography of Anglo-America, and rural and nonmetropolitan geography.

THE MASTER'S PROGRAM

The department offers both the thesis and non-thesis option for the Master of Science degree. Both options require a minimum of 45 quarter hours beyond completion of a sound undergraduate major program. At least two-thirds of the total hours in the graduate program must be at or above the 5000 level, and must include 5100 (at each offering during residency), 5150, 5160 and 6 quarter hours at the 6000 level. In the thesis option, no more than 9 hours may be thesis courses. A final examination is required in both programs.

THE DOCTORAL PROGRAM

The doctoral 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, 5720; and (at each offering during residency) 5150. A minimum of 15 hours of 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 the dissertation proposal. Also required is a formal oral examination on the dissertation and on other aspects of the program as determined by the student's doctoral committee.

3410 Intermediate Economic Geography (4) Concepts, theories, and practices of regional analysis. Location patterns in agriculture, manufacturing, and service activities. F or W

3430 Urban Geography (4) Concepts and theories concerning development and significance of systems of cities and internal morphology of cities. F or 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. F or W

3460 Geography of Resources (4) Study of factors related to variations in resource availability from time to time and from place to place, with particular emphasis upon energy and metallic resources. F or Sp.

3520 Climatology (4) General circulation system leading to world pattern of climates. Climatic change and modification, interrelationship of climate and human activity. W or Sp.


3610 Political Geography (4) Importance of geographic factors for understanding political relationships within and among 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, statistical techniques and socio-cultural evolution. F

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. F

3910 Regional Geography of United States and Canada (4) Major physical, economic, and social distributions as they give distinctive character to regions of United States and Canada. F

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. W

3940 Geography of Appalachia (4) Interrelation of physical, economic, and social patterns to give distinctive character to the region and its parts, especially Southern Appalachia. Appalachia in perspective in the current American scene. F

4075 Geography of Transportation (4) Geographic examination of transportation systems, emphasizing transport of people on highways and by public facilities. Relationship of these systems to changing geography of cities and urban hinterlands. Sp.

4160 Quantitative Methods in Geography (4) Geometric, cartographic, and statistical techniques as direct and indirect tools. Point pattern analysis and analysis of areal units. Pre-req: Mathematics 3000 or consent of instructor. W

4210 Problems in Geographic Method (4) Examples of problems and approaches in geographic analysis and synthesis. Emphasis on character of geographic research, areal sampling, generalization, classification, regionalization, and questions of scale. F

4510 Principles of Geomorphology (4) (Same as Geology 1110).

4550 Geography of Soils (4) Soils as physical systems and their relationship to environments; investigation of specific cases of the role of soil in management of environmental systems.

4610 Industrial Geography (4) Factors affecting location of manufacturing activities, with emphasis on the United States. Prereq: 3410 or consent of instructor.

4630 Geography of Agriculture (4) A


4720 Data Mapping (4) Automated techniques of representing surfaces, using geographic information systems. Recommended prereq: 3700 and knowledge of a computer language.

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 various types of imagery for geographic interpretation and simple mapping. Prereq: Consent of instructor.

4750 Interactive Computer Graphics (3) (Same as Computer Science 4750.)

4799 Practicum in Cartography/Remote Sensing (2-6) Prereq: Written consent of instructor required prior to registration. May be repeated. Maximum 6 hrs. E

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is complete. May not be used toward degree requirements. May be repeated. S/NC only. 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 6 hrs. S/NC only. W, Sp

5101 Foreign Study (1-12) See page 96. Prereq: Written consent of instructor prior to registration. E

5102 Off-campus Study (1-12) See page 96. Prereq: Written consent of instructor prior to registration. E

5150 Introduction to Geographical Research (3) Aims of geographical research; survey of printed geographical literature. Recommended prereq: 3600 or consent of instructor.

5160 Research and Field Problems (4-6) Development of research problems, preparation of appropriate study designs, and practical field application. Su

5170 Geographic Concept and Method (3) Traditional and modern thought regarding nature, scope, problems, and methods of geography.

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 registration. Prereq: Written consent of instructor prior to registration. 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. May 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: 3660 or consent of instructor. A

5310 Topics in Regional Geography of the United States (3) Intensive analysis of problems and trends in one or more regions of the United States, excepting American South. May be repeated with consent of instructor. Maximum 9 hrs. A

5320 Topics in the Geography of the American South (3) Geographic perspective on economic and cultural aspects of southeastern United States. Topics vary. May be repeated with consent of instructor. Maximum 9 hrs. A

5410 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: 3550 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: Consent of instructor. May be repeated with consent of instructor. A

5660 Advanced Political Geography (3) Geographic consequences of public decisions, emphasis on understanding how administrative and political processes affect public land management, spatial distribution of public goods, and urban morphology. Prereq: 3610 or consent of instructor.

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.

5760 Seminar in Physical Geography (3) Examination of trends, problems, and methods of physical geography. Prereq: Consent of instructor.

5790 Seminar in Cartography (3) Trends, concepts, and problems in modern cartography. Prereq: 3720, or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. A

5815 Regional Geomorphology (4) (Same as Geology 5915.)

5915 Doctoral Research and Dissertation (3-15) P/NP only. E


THE MASTER'S PROGRAM

The department requires a minimum of 45 quarter hours in courses (other than thesis) numbered above 3999. A minimum of 24 hours in geology 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 course 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 48 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 recommended.

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 graduate credit and completed with a B average in appropriate mathematics, statistics, or computer science courses. The courses must be taken 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 required by the student's entire committee.
**College of Liberal Arts/Geological Sciences**

**3180 Mineralogy (4)** Introduction to crystallography and study of minerals. Laboratory includes hand specimen, chemical and x-ray methods of identification. Prereq: 1410. Chemistry 1110-20 or equivalent. 3 hrs and 1 lab.

**3210-20 Invertebrate Paleontology (4, 4)** Systematic review of important Metazoan invertebrate fossil groups. 3210—Porifera to Annelida, including cnidarians, echinoderms, brachiopods, and corals. 3220—Mollusca through lesser Chordata, including arthropods and echinoderms. May be taken separately or in sequence. Prereq: 3520. Biology 1210-20 or consent of instructor. 3 hrs and 1 lab or field period.

**3260 Paleobiology (4)** Introduction to principles and methods for the study of the fossil record 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 biota 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 or field period.

**3310 Introductory Petrology (4)** Introduction to classification and properties of igneous and metamorphic rocks, processes which produce them, and techniques of analysis in which they form. Prereq: 3180. Coreq: 3190. 3 hrs. and 1 lab.

**3330 Geology of East Tennessee (4)** Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor.

**3380 Stratigraphy-Sedimentation (4)** Introductory study of stratigraphic principles and practices and of sedimentary processes and interpretation of depositional environments. Prereq: 1420 and 3160. 3 hrs and 1 lab/field period.

**3390 Structural Geology (4)** Introductory discussion of structures such as 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.

**3510 Introductory Environmental Geology (4)** Geologic processes involving earth environment and resources, and geologic parameters associated with their control and usage. Prereq: 1420 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 or field period.

**4110 Principles of Economic Geology (4)** Geologic processes, classification, of mineral deposits, survey of different types of mineral deposits with examples. Prereq: 3160, 3190, 3310 or equivalent. Recommended prereq: 4610. 3 hrs and 1 lab.

**4115 Elementary Applied Geophysics (4)** Basic principles of electrical, seismic, gravity and magnetic surveying. Recommended prereq: 4610. 3 hrs and 1 lab.

**4120 Geology of East Tennessee (4)** Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor. Prereq: 1410. Chemistry 1110-20 or equivalent. Recommended prereq: 4240. 3 hrs and 1 lab or field period.

**4250 Evolution of Higher Taxa (4)** Current evolutionary theory in context of paleontology, patterns of evolution in fossil organisms at family level or higher. Prereq: 4650 and recommended prereq: 3210. 2 hrs and 1-2 hr. seminar.

**4260 Biostratigraphy (3)** Application of paleontologic data to stratigraphic study, codification of stratigraphic nomenclature and recommended practice. Prereq: 3160 or 3310 or coreq. 2 hrs and 1 lab/field period.

**4270 Micropaleontology (4)** Survey of geologically stratigraphically important microfossils and their biological association if known. Special emphasis is given to fossil ferns, protists, and palynomorphs. Prereq: 3260 or consent of instructor.

**4307 Introduction to X-Ray Methods (1)** Generation and nature of x-rays as applied to x-ray diffraction, x-ray fluorescence and electron microprobe analysis. Prereq: 3180 or consent of instructor.

**4308 Electron Microprobe and X-Ray Fluorescence Analysis (3)** Application of electron microprobe and x-ray fluorescence techniques as analytical tools for determination of chemical composition of solid particles such as minerals and rocks. Prereq or coreq: 4307 or consent of instructor.

**4309 X-Ray Diffraction Methods (3)** Application of x-ray in identifying minerals, including powder camera, Gandolfi camera and diffractometer. Prereq or coreq: 4307 or consent of instructor. 2 hrs and 1 lab.

**4310 Geologic Mapping (4)** Introduction to and methods of geologic mapping. Prereq: 12 hrs geology. 3 hrs and 1 lab or field period.

**4313 Quaternary Geology of North America (4)** Quaternary geologic processes, stratigraphy, sedimentology and geomorphology of glaciated and unglaciated North America and oceans. Prereq: 1410, equivalent course, or consent of instructor. 2 2-hr lectures per week.

**4322 Quaternary Paleoecology (4)** Pollen and plant-macrofossils, characterization of vegetation and climate change during Quaternary. Prereq: Consent of instructor. 2 2-hr lectures per week.

**4333 Quaternary Field and Lab Techniques (4)** Techniques for environmental characterization and reconstructions, pollen and plant-microfossil identification, description of site stratigraphy and sediments. Prereq: 1410, equivalent course, or consent of instructor. 2 hrs and 2 labs.

**4370 Tectonic Styles (4)** Elements, habitats, and geotectonic causes of basic styles of tectonic deformation are presented on maps, sections, aerial photographs and fabric diagrams. Prereq: 3370 or consent of instructor. 3 hrs and 1 seminar or lab.

**4440 Field Geology (9)** Five-week field course, first term summer quarter. Advanced undergraduates or first-year graduates in geology. Employes entire time of students. Field techniques demonstrated, practiced and applied to solution of geologic problems. Prereq: 12 hrs geology and consent of instructor.

**4460 Geologic Photography, Photogrammetry and Remote Sensing (4)** Terrestrial, airborne, and satellite geologic remote sensing, photographic principles and practice, digital photography, principles of nonphotographic remote sensing systems.

**4510 Principles of Geomorphology (4)**1 Gradational processes acting at earth's surface and landforms produced. Prereq: 1400-1700 or equivalent. (Same as Geography 4510.) 3 hrs and 1 lab.

**4520 Process Geomorphology (4)**1 Gradational processes operation on and near earth's surface, applied geomorphology and field work in geomorphology. Prereq: 1430 and 4510. 3 hrs and 1 lab or field period.

**4550 Optical Mineralogy (4)** Identification of minerals and their control and misuse. Prereq: 1420 or consent of instructor. 2 hrs and 1 lab or field period.

**4570 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: 3370. 3 hrs and 1 seminar or lab.

**4620 Process Geomorphology (4)** Modern depositional environments and recognition of ancient analogs; facies applications to exploration and production geology.

**5210 Special Problems in Geology (1-4)** Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

**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 quarters) or consent of instructor. (Same as Botany 5290 and Zoology 5290.)

**5310 Depositional Environments and Models for Exploration (4)** Modern depositional environments and recognition of ancient analogs; facies applications to exploration and production geology.

**5370 Mesofabric Analysis (4)** Techniques of gathering, processing, and interpreting tectonic mesoscopic fabric data. Prereq: 3370. 3 hrs and 1 lab or field period.

**5460 Photogeologic Interpretation (4)** Advanced photogrammetric techniques to obtain geological measurements from aerial photographs. Practice in photographic interpretation of selected areas of various geologic features. Prereq: Consent of instructor.

**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.

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*Not available for graduate credit for geology majors.

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*Not available for graduate credit for geology majors.*
and mineral equilibria. Laboratory emphasis petro- 
ment, and effects on texture, chemical composition, 
clastic rock types, role of transport and depositional 
5540 Terrigenous Clastic Sedimentary Petrology 
hrs and 2 labs.

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mended:4550 . 3 hrs and 1 lab.

5550 Carbonate Sedimentology (4) Environments 
processes in affecting sediment texture and com-

5635 X-Ray Diffraction: Single Crystal Techni-
ques (3) Single crystal diffraction techniques, em-
phasis on peclusion and Weissenberg photograph-
ry. Crystal symmetry and diffraction, reciprocal lat-
tice and Ewald sphere constructions, space group 
determination and application to geological prob-
lems. Prereq: Knowledge of introductory crystal-
lography and consent of instructor.

5640 Clay Mineralogy (4) Origin of clay minerals;
structural studies and properties, application of mineralog-
techniques in clay mineral studies. Prereq: 3180 
and 5630 or equivalent. 2 hrs and 2 labs. A

5650 Thermodynamics for Geologists (3) Princi-
Prereq: Chemstry 11110-20-30 and cal-
culus of a single variable or equivalents.

5690 Cathodoluminescence Petrography (2) Ap-
plication to geological problems. Prereq: 3180 and 
4550 or consent of instructor. 1 hr and 1 lab.

7710 Advanced Paleontology (4) Fossil Inverte-
brates.

7720 Paleontological Nomenclature and Techni-
ques (4) Codification of biologic nomenclature as it 
applies to paleontology, basic techniques in prepara-
tion and illustration of paleontologic materials and 
manuscript preparation for publication. 3 hrs and 1 
lab.

5820 Strata-bound and Stratiform Sulfide De-
posits (4) Classification, distribution, characteristics 
and genesis 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. Prereq: 4110 or consent of instructor. 2 hrs 
and 3 2-lab and seminar periods.

5830 Magmatic Mineral Deposits (4) Classific-
ation, distribution, characteristics and genesis of mineral 
deposits related to magmatic processes. Magmatic 
segregation deposits of ultramafic-mafic association 
and porphyry Cu-Mo deposits. Prereq: 4110 or con-
sent of instructor. 2 hrs and 2 lab/fldi/semi periods.

5840 Ore Petrology (4) Ore mineral assemblages 
we reflected-light microscopy. Identification of ore 
minerals and interpretation of paragenesis from tex-
tures. Typical samples from different types of ore 
deposits, selection of choice. Prereq: 4110 and 4550, 
or consent of instructor. 2-2.2 hrs lab.

5850 Regional Studies in Geology (1-3) Literature 
study and seminars on specific regions of geologic 
interest supplemented by field trip. Prereq: Consent 
of instructor. May be repeated. Maximum 9 hrs.

5860 Coal Depositional Environments (4) Coal 
stratigraphy and depositional environments, Carbo-
naceous rocks of Appalachian region, problems of 
coal mining and coal quality. Prereq: 3360 or 4130.

5915 Regional Geomorphology (4) Selected 
geomorphologically-related areas, which have com-
mon elements such as history or development, re-
lated processes which have produced generation, and 
similar assemblies of landforms. May be repeated 
with consent of department. (Same as Geography 
5915-20-30.)

6000 Doctoral Research and Dissertation (3-15) 
P/NP only E

*6110 Seminar in Stratigraphic Geology (3)

*6210 Seminar in Paleontology (3)

*6310 Seminar in Structural Geology (3)

*6410 Seminar in Mineralogy (3)

*6510 Seminar in Petrology (3)

*6610 Seminar in Economic Geology (3)

*6710 Seminar in Geochemistry (3) Prereq: 4610 
or consent of instructor.

NOTE: Registration for 6000-level courses may be repeated 
with consent of department. Maximum 9 hrs per course.

Germanic and Slavic Languages

MAJORS

German Language and Literature

DEGREES

MA, M.A., D.A., Ph.D.

Emeritus Professors: H. W. Fuller, Ph.D. Wisconsin; R. L. Hillier, Ph.D. Cornell.

Professors: H. Krett (Head), Ph.D. Ohio State; J. E. Falen, Ph.D. Pennsylvania; J. C. Osborne, Ph.D. Northwestern; M. P. Rice, Ph.D. Vanderbilt.

Associate Professors: J. L. Elliott, Ph.D. Michigan; D. M. Fiene, Ph.D. Indiana; N. A. Lautner, Ph.D. Wisconsin; D. E. Lee, Ph.D. Stanford; C. J. Mellor, Ph.D. Chicago.

Assistant Professors: C. Hodges, Ph.D. Chicago; U. Ritzenhof, Ph.D. Connecticut.

The Department of Germanic 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.A.T.) 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 a minimum of 45 quarter hours including 21 hours of coursework above 5000 level and 9 hours of Thesis 5000.

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 coursework 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 from the seminar (5200) and the literary or philological seminars (6210-20-30-40-50-60 and 6310-20-30). At least 9 hours 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 knowledge of the language, 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 must be 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 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 candidate's 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 Divi-

Graduate Students (3, 3, 3) Elements of language, elementary and advanced readings. Open to graduate students preparing for language ex-

amination, and 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 Transla-
tion (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 re-

quired for 3 hrs. F, W, Sp

3240 Old Norse Literature in German Translation (3-4) Prose readings of sagas of Norwegian kings, great Icelandic family sagas, and Vinglas sagas, nar-

rative discovery of the Middle Ages around 1000. Mythological and heroic poems of the Edda.

4110-20-30 Studies in Classical and Modern Wri-
ters (3, 3, 3) Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in Eng-

islish translation) or equivalent. May be repeated with consent of department.

4140-50 Selected Topics in German Literature from 1750 to the Present (3, 3) Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in Eng-

islish translation) or equivalent. May be repeated.

4160 Studies in German Authors (3) Life and works of a single outstanding German literary figure. Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in Eng-

islish translation) or equivalent. May be repeated.

4170 Theatrical German (1-3) Performance in one 
or more German plays. Prereq: Intermediate Ger-

man 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) 4210—Lyric poetry. 4220—Drama. 4230— Narrative prose. Prereq: 8 hrs of 3000 courses (ex-

clusive of 3010-20-30, 3210-20-30, 3310) or equiva-

lent.

4250 Introduction to Descriptive Linguistics (3) (Same as French, Russian, Spanish, and Linguistics 4520) F

*6110 Seminar in Stratigraphic Geology (3)

*6210 Seminar in Paleontology (3)

*6310 Seminar in Structural Geology (3)

*6410 Seminar in Mineralogy (3)

*6510 Seminar in Petrology (3)

*6610 Seminar in Economic Geology (3)

*6710 Seminar in Geochemistry (3) Prereq: 4610 
or consent of instructor.
4260 Introduction to Historical and Comparative Linguistics (3) Linguistic change, protolanguages. Phonological and morphological change. Cultural, historical, sociological influences upon the development of language. Semantic change. Lexicography. All these topics copiously illustrated by selected examples from Indo-European languages. Prereq: 9 hrs of upper division English, or 9 hrs of upper division courses in Modern or ancient language (exclusive of German and French) and prospective teachers. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs each.

4270 Introduction to Germanic Linguistics (3) Phonetics and phonology of German. German grammar and vocabulary from descriptive point of view. Dialects of German. Other Germanic languages.

4310-20 History of German Language (3, 3) 4810-20-30 German Civilization (3, 3, 3) Prereq: Intermediate German or equivalent. Advanced work in phonetics, pronunciation, and syntax of Old High German and ninth centuries. Dialects. Representative prose readings. 6130—Literature and Linguistics: prose and poetry of period from linguistic and literary point of view. Development of language in Old High German period.

6140 Old Sax (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) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs each.

6310-20-30 Seminar in German and Germanic Philosophy (3, 3, 3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs each.

5420-30-40-50-60 Studies in German Literature (3) Content varies. Students from other institutions should have an M.A. degree and must be reviewed by the Graduate Awards and Selection Committee after their first year of work at The University of Tennessee. May be repeated. Maximum 9 hrs each.

5710 Introduction to Old Norse (3) Phonology, morphology, and syntax of Old Norse. Representative readings in Old Norse.

5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. Icelandic saga literature.

5730 Readings in Old Norse Poetry (3) Intensive reading of Eddic poems as a literary genre and reposition of ancient Germanic customs, legends, and mythology.

6000 Doctoral Research and Dissertation (3-15) Pr/NP only. 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 Sax (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) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs each.

6310-20-30 Seminar in German and Germanic Philosophy (3, 3, 3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs each.

5210-20-30 College Teaching of German (1,1, 1) Prereq: 3810-20-30 or equivalent. Preparation of papers. F

5300 or above of which 3 hours must be 6300 or above. Total hours—45.

5300 Thes (1-15) P/NP only. E

5420-30-40-50-60 Studies in German Literature (3) Content varies. Students from other institutions should have an M.A. degree and must be reviewed by the Graduate Awards and Selection Committee after their first year of work at The University of Tennessee. May be repeated. Maximum 9 hrs each.

5540 German Civilization (3) Prereq: 3010-20-30, 3210-20-30-40-50-60-70) or equivalent. High German; 5420-30-Readings in Medieval German, courses in French, Russian, Spanish, and Linguistics 4260. W

5500 Thes (1-15) P/NP only. E

5100 German Phonetics and Advanced Grammar (3) Advanced work in phonetics, pronunciation, and selection topic using comparative approach.

5101 Foreign Study (1-12) See page 96. E

5102 Off-campus Study (1-12) See page 96. E

5103 Independent Study (1-12) See page 96. E

5160 Introduction to German Semantics (3)

5200 Proseminar (3) Bibliography: methods; illustrative problems; preparation of papers. F

5210-20-30 College Teaching of German (1, 1, 1) Required of all M.A., MACT, or Ph.D. candidates, 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) 5410—Introduction to Middle High German; 5420-30—Readings in Medieval German literature. F; W; Sp

5500 Studies in German Literature (3) Content varies. May be repeated. Maximum 9 hrs. Su

5510 German Humanism and the Reformation (3)

5520 German Baroque Literature (3)

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) E

5710 Introduction to Old Norse (3) Phonology, morphology, and syntax of Old Norse. Representative readings in Old Norse.

5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. Icelandic saga literature.

5730 Readings in Old Norse Poetry (3) Intensive reading of Eddic poems as a literary genre and reposition of ancient Germanic customs, legends, and mythology.

4271 Introduction to Slavic Linguistics (3) (Same as Linguistics 4271.)

4310-20-30 Advanced Studies in Russian Language (3, 3, 3) Intended primarily for students majoring in Slavic or 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) Intended primarily for students participating in programs in Russian and East European Area Studies, course will involve individual study relating to student's major field. Prereq: 9 hrs of 3000 courses in Russian (exclusive of 3010-20-30, 3210-20-30-40-50-60-70) or equivalent.

Greek

See Classics

History

MAJOR

DEGREES

MA., Ph.D.

Professors:

P. H. Bergeron, Ph.D. Vanderbilt; E. E. Chmieloski, Ph.D. Harvard; R. E. Duncan, Ph.D. California (Berkeley); H. S. Fink (Emeritus); Ph.D. Princeton, L. P. Graff, Ph.D. Harvard, G. T. Hack, Ph.D. Harvard; R. W. Haskins (Emeritus), Ph.D. California (Berkeley); C. O. Jackson, Ph.D. Emory, M. M. Klehm, Ph.D. Columbia, R. L. Landen, Ph.D. Princeton.


Assistant Professors:


THE MASTER'S PROGRAM

Plan I: Course requirements include History 5240, and either 5250 or 5260; one M.A. reading course, at least 6 additional hours 5300 or above of which 3 hours must be 6300 or above. Total hours, including these—45. Plan II: History 5240, either 5250 or 5260; two M.A. reading courses; 12 additional hours 5300 or above, at least 2 of which must be 6300 or above. Total hours—45.

THE DOCTORAL PROGRAM

1. Admission: (a) Acceptable scores on the Graduate Record Examination (General Aptitude and History Achievement). (b) Students successfully completing the M.A. degree at The University of Tennessee must be recommended by the Department of History.

2. Residence and Course Work: Beyond the Bachelor's degree a minimum of 75 credit hours in course work is required, of which not less than 45 must be in courses that are numbered over 5000. Not less than 6 quarters

*Alumni Distinguished Service Professor.
of the required 9 quarters of residence work shall be under the supervision of the staff of the University. The student must present four credits in each of the required 9 quarters of residence work. The comprehensive examination will be written and oral. The candidate must pass with an average of B in the final quarter.
and weaponry involved in our wars, and relationship between American society and its armed forces.

4500 History of Medieval England (3) From Anglo-Saxons to coming of Tudors; relationship between legal and constitutional developments and structure of society.

4510-20 Tudor-Stuart England (3, 3) 4510—Reformation in England; Thomas More, Elizabeth I, and Mary, Queen of Scots. 4520—Puritanism, English Civil War, Restoration, Glorious Revolution and Scientific Revolution; Stuart kings, Oliver Cromwell, Milton, Hobbes, and Locke.

4551 British Society and the Industrial Revolution, 1780-1848 (3) Emergence of modern industrial society: urbanization, mechanized factory production, social engineering via schools and police, mass politics and reform, class conflict, economic and population growth.

4610-20-30 The American Frontier and Westward Movement I, II, III (3, 3, 3) Settlement and development of the "West" throughout American history. Movement I, II, III (3, 3, 3) Settlement and development of the "West" throughout American history.

4641-21 History of Japan (4, 4) 4670 Medieval Europe, 1780-1850 (3) Reform, resistance, and the advent of Liberalism and Nationalism.

4811-21 History of Japan (4, 4) 4840 History of Mexico (3) 4850 History of the Caribbean (3) Caribbean region from discovery and colonization to contemporary times.

4870-90-00 China (3, 3, 3) 4870—Chinese high culture from Confucius to Mao Tse-tung. Traditional religion, philosophy, fine arts, literature; cultural legacy under communism; similarities and differences between Chinese and Western cultures. 4880—To 1850. Uniqueness of Chinese experience, influence on Japan and West, relevance in today's world. 4890—Modern China since 1850. Chinese Revolution in context: Imperialism, reform, nationalism, communist movement, Mao Tse-tung; China in today's world. No previous knowledge of China required.

4910-20-30 History of the South (3, 3, 3) 4910—1607-1850. 4920—1850-1870. 4930—Since 1870.


5003 Thesis (1-15) P/NP only. 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 96. E

5102 Off-campus Study (1-12) See page 96. E

5103 Independent Study (1-12) See page 96. E

5211-5225 M.A. Reading Courses (3 hrs each) Directed reading courses in preparation for fields required for Master's oral examination. 5211, Ancient. 5212, Medieval. 5213, Early Modern Europe; 5214, Europe Since 1769; 5215, American History to 1815; 5216, American History Since 1769; 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 (5, 5, 5) 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 MAC. 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 milieux from which they emerge; modern trends in historical methodology. Sp

5290 Quantitative Analysis of Historical Data (3) Prereq: Sociology 3120 and 3130, 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.

5340 Topics in Latin American History (3)

5350 Topics in Latin American History (3)

5360 Topics in Latin American History (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.

5441 Topics in French History (3)

5443 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 Russian History (3)

5550 Reaction and Reform in England, 1789-1848 (3)

5560 Anglo-Irish Relations (3)

5560 Topics in Russian Social and Cultural History (3)

5565 Topics in American History (3)

5600 Topics in Medieval History (3)

5650 Topics in Russian History (3)

5670 Topics in Medieval History (3)

5675 Topics in the Early National Period of American History (3)

5680 Topics in Medieval 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) P/NP only. E

6210-30-40 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)

6610 Seminar in American Colonial History (3)

6620 Seminar in the Era of the American Revolution (3)
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'S PROGRAMS

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 45 hours of work in courses numbered above 4000 must be earned along with 36 additional hours of work in acceptable courses numbered above 4000. Of the additional hours, 9 must be in an area outside the department and 21 must be in courses in mathematics numbered above 5000.

After two quarters of graduate study, a student whose supervisory committee gives its approval may choose the non-thesis option, for which 45 hours of work in courses numbered above 4000 are required. Of these, 30 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 examination 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

Students may not take examinations in both d. and e. nor may they take examinations in both f. and g. as their comprehensive examination subjects. Those students who choose four from this list must choose two from a. through e. and the students who choose only three from this list must choose one from a. to e.

A student selecting only three from the above list will take an examination in each of the following areas: fluids, elasticity, mathematical ecology, for which 12 hours of adequate coursework will be taken by both the major department 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 to the Graduate Committee and 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-n exams may be taken at any one time, where n denotes the number of exams previously passed by the student.

c. A student may take a collection of written examinations at any time if he/she has not taken more than 4-n exams. No student will be permitted to take another round 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 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 comprehensive 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 at least two hours in a reading 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 in early January. Note: Math 3050, 3060, 3090, 3100, 3110, 3310, 3320, 3330, 3510, and 3720, are intended primarily for students preparing to teach in elementary or secondary schools.

Any 3000 or 4000 course in the department whose course number ends in "zero" may be offered as an honors version. In this case, the last digit will appear as an "8" and the title will be preceded by the word "Honors" both in the timetable and on the student's transcript. Honors versions of courses listed in the Graduate Catalog are acceptable for graduate credit. Such courses may be offered upon the...
3050 Elementary Probability and Statistical Analysis (3) Combinatorial problems; sample spaces, sets, and events; statistical independence; axiomatic probability theory; random variables and their distributions; simple random processes. Does not satisfy requirements of major or minor in mathematics. Prereq: 1550-60 or equivalent. W, Sp

3060 Elementary Statistical Analysis (3) Elementary probability distributions used in statistics: binomial, Poisson, and normal and their properties; sampling theory; confidence intervals and statistical tests of hypotheses; least squares and linear regression. Does not satisfy requirements of major or minor in mathematics. Prereq: 3050 or consent of instructor. Sp, Su

3090 Polynomials and Rings (3) An introduction to abstract algebra, beginning with study of integers followed by more general notion of rings, integral domains, and fields. Emphasis is given to certain ring theoretic properties shared by integers and polynomial rings over certain fields. Prereq or coreq: 3100 or consent of instructor. W, Sp

3100 Logic and Sets (3) Elements of mathematical logic: elementary algebra of sets. Primarily for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Prereq: 1 yr college mathematics. F, W, Sp

3110 Real Number System (3) Laws of arithmetic; rational and irrational numbers; fields. Prereq: 1 yr of college mathematics. Primarily for students in the College of Education. Does not satisfy requirements of major or minor in mathematics. Su


3150 Introduction to Numerical Algorithms and Programming (3) (Same as Computer Science 3150.) E

3155 Introduction to Numerical Algorithms (3) (Same as Computer Science 3155.) E

3220 History of Mathematics (3) Survey of development of major branches of mathematics, from ancient to modern times. Prereq: 1850 or 2550 or equivalent.

3310 Advanced Euclidean Geometry (3) Triangles and circles, constructions, modern concepts. Prereq: 1 yr of college mathematics. F

3320 Non-Euclidean Geometry (3) Foundations of geometry. Elliptic and hyperbolic plane geometry. Prereq: 1 yr of college mathematics. W

3330 Transformational Geometry (3) Fundamental transformations in Euclidean geometry. Classification of isometries and similarities; symmetries of a polygon; inversions. Prereq: 1 yr of college mathematics. Sp

3510 Intermediate Analysis for Teachers (3) Primarily for students in secondary mathematics education. Course covers elements calculus from an advanced viewpoint with emphasis on proofs of basic theorems. Promo covered includes limits of sequences and functions, continuous functions, derivatives, infinite integral, and fundamental theorem of integral calculus. Does not satisfy requirements of major or minor in mathematics. Prereq: 1550-60 or 1860. Su


3725 Advanced Discrete Structures (3) (Same as Computer Science 3725.) E

3780-90 Introduction to Combinatorial Theory (3-3) Introduction to problems of arrangement and selection within discrete systems. Enumeration by recurrence relations, generating functions, graph theory; finite geometries and finite fields, partitions, block designs. Prereq: 2860 or consent of instructor. F, W, or Sp.

3810 How To Prove It (3) Course is designed to improve understanding of nature and methods of mathematical proof by means of practice and participation in seminar setting. Variable content but will include certain standard topics such as elementary set theory, relations and functions, and mathematical induction. Coreqs: 2850 or 2860. E

3861 Mathematical Models in the Life Sciences (3) Introduction to difference equations and differential equations. Mathematical modeling techniques applied to biological phenomena. Does not satisfy requirements of major or minor in mathematics. Prereq: 1841-51 or consent of instructor.

3920-30 Topology of Euclidean Spaces (3, 3) Topics will include topology of line and plane, separation properties, compactness, connectedness, continuity, continuous functions, homeomorphisms, and topological invariants. Must be taken in sequence. Prereq: 3810. 2850, or consent of instructor, W, Sp.

3990 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

4050-60 Matrix Algebra and Applications (3, 3) Vector spaces, linear transformations, eigenvalues and eigenvectors, similarity and unitary transformations, singular value decomposition and least square problem, vector and matrix norms. Jordan canonical form, evolution of discrete and continuous systems, quadratic forms and variational principles, related topics. Must be taken in sequence. Prereq: 2860.

4070 Matrix Algebra and Applications (3) Topics to be chosen at discretion of instructor.

4120 Linear Algebra (3) Abstract vector spaces, linear transformations, and their matrices, systems of linear equations and determinants, inner products, and diagonalization of symmetric matrices. Prereq: 2860 or 4500. F

4150-60 Abstract Algebra (3, 3) Equivalence relations and partitions, properties of integers, elementary and rings, polynomial rings, integral domains, divisibility, unique factorization domains, fields. Must be taken in sequence. Prereq: 2860. W, Sp.

4225 Numerical Solution to Equations and Numerical Approximations (3) Numerical solution to equations and numerical approximations. Introduction to computation, instabilities, rounding errors, solution of a single nonlinear equation, introduction to iterative methods for linear and nonlinear systems. Polynomial interpolation, curve fitting, power methods for eigenvalues. Approximation by polynomials, piecewise polynomials, trigonometric and rational functions. Prereq: 3150 or 3155. (Same as Computer Science 4225.) F, W


4250-60 Introduction to Complex Analysis (3, 3) 4250—Complex numbers, Cauchy-Reimann equations, Cauchy's theorem, Taylor and Laurent series, residues and their properties, 4260—Conformal mapping, Schwarz-Christoffel transformations, Dirichlet problem, applications (steady temperature, electrostatics), additional topics in complex function theory. Must be taken in sequence. Prereq: 2860; one 4000-level mathematics course recommended.


4540 Infinite Series and Functions of Several Variables (3) General theory, power series and Taylor's formula, uniform convergence. Partial differentiation and multiple integrals. Applications of multivariable functions. Prereq: 2860.


4640 Calculus of Finite Differences (3) Real difference equations, application to problems in engineering and physics. Prereq or coreq: 4610.


4710 Vector Analysis (3) Fundamental operations, basis vectors, dot and cross products, directional derivatives, divergence and curl of vector fields, line and surface integrals, divergence theorem of Gauss, and Stokes' theorem. Does not satisfy requirements of major or minor in mathematics. Prereq: 2860. E

4750-70 Introductory Probability Theory (3, 3, 3) 4750—Elementary combinational analysis, probability of discrete events, and stochastic independence, binomial, Poisson, hypergeometric and normal distributions. 4760—Contingency tables, correlation and characteristic function of random variables, infinite sequences of random variables, the weak and strong laws, electronic numbers, and the central limit theorem. 4770—Markov chains; limiting probabilities; steady-state and stationary distributions; Stochastic processes. 4780—Poisson, birth and death processes; Kolmogorov equations. Prereq: 2840-50-60. F, W, Sp.

4810 Elementary Number Theory (3) Divisibility, congruences; theorems of Fermat and Wilson, primality testing; multiplicative functions, Euler's function, inclusion-exclusion, and theorems of Dirichlet. Prereq: 2860 or consent of instructor. Su

4980 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study with faculty guidance. May be repeated. Maximum 9 hrs.
**5001 Elementary Functions from an Advanced Standpoint for Teachers (3-4) Order and completeness of real numbers; limits of sequences, derivatives of functions; definitions and derivatives of exponential, logarithmic and trigonometric functions; infinite series; Taylor’s series, Maclaurin’s series; applications to construction of logarithmic and trigonometric tables. Prereq: 3510 or 3110 or consent of instructor.

**5012 Differential Geometry for Teachers (3-4) Advanced techniques applied to graphing functions. Curves, surfaces, parametrizations, singular points, tangent lines and tangent planes, osculating planes, arc length of curves in plane and curves on surface, curvature, torsion, asymptotes, local coordinates. Roll tests. Prereq: 1 yr of calculus, or consent of instructor.

**5013 Geometry for Teachers (3-4) Primarily for high school teachers of geometry. Historical and modern presentations of topics encountered in a high school geometry class: axioms, synthetic and analytic, models; betweenness; congruence of segments and triangles; parallel postulate; similarity area; ruler and compass constructions; Klein’s. Erlangen Program. Prereq: Consent of instructor.

**5014 Analysis for Teachers (3-4) Functions of several variables, vectors, limits and continuity, partial derivatives, directional derivatives and gradient, implicit function theorem, maxima and minima, transformations. Prereq: 3510 or consent of instructor.

**5015 Probability and Statistical Inference for Teachers (3-4) Probabilistic distributions including binomial, hypergeometric, and Poisson; moment generating functions; expectation of continuous random variables; moment-generating functions and first order theorems; elementary numerical methods. Prereq: 1 yr of calculus and 3505 or consent of instructor.

5050-60-70 Mathematical Logic (3, 3, 3) Truth functions; syntax and semantics of some propositional and first order theories; model theory; consistency and completeness, decidability.

5051 Introductory Business Mathematics (3) Graphing of simple equations, straight lines, circle, parabola, functions, algebra of functions, limits, continuity, derivatives of algebraic functions, applications to maxima and minima, convexity and concavity, implicit differentiation, higher derivatives, and applications. Credit available only to satisfy MCA core requirement. Prereq: Math 1550 or equivalent.

5052 Mathematics for Business Decisions (3) Exponential function, applications to growth and decay models, antiderivatives, integration as area, fundamental theorem of calculus, method of substitution, integral tables, integration by parts, Simpson’s rule, improper integrals, applications, functions of two variables, partial derivatives, integration over simple regions, applications, introductory matrix algebra, application to solution of simultaneous equations. Credit available only to satisfy MCA core requirement. Prereq: Math 5051 or equivalent.

5110-20-30 Theory of Functions of a Complex Variable (3, 3, 3) Complex numbers; infinite series; analytic functions, conformal mappings, analytic continuation; special functions: Riemann surfaces. Prereq: 4510-20 for 5110; 4530 for 5120. Must be taken in sequence. F, W, Sp


5310-20-30 Introduction to Higher Geometry (3, 3, 3) Projective spaces; coordinates and transformations; conics and quadrics. Elliptic and hyperbolic geometry from viewpoint of projective geometry. Prereq: 4510-60. Must be taken in sequence.

5370-80-90 Mathematical Principles of Fluid Mechanics (3, 3, 3) Equations of motion, incompressible, compressible, inviscid and viscous, inviscid perfect gables, shock waves in perfect fluids, viscous flows and boundary layer phenomena, additional special topics. Prereq: 4530 or 4710 or consent of instructor. A


5440 Calculus of Variations (3) Function spaces, variation of functional, we are, extremum problems subject to conditions. Prereq: 3510 or 3551, and 4530. W, Sp

5450-60-70 Introduction to Partial Differential Equations (3, 3) Formulation of problems in two variables; properties of elliptic, hyperbolic and parabolic equations, separation of variables, and Fourier series. Prereq: 4510-20 and 4610. F, W, Sp

5465 Finite Difference Methods for Partial Differential Equations (3) Finite difference techniques for solution of parabolic, elliptic, and hyperbolic equations. Computer implementation, stability, consistency and convergence; nonlinear problems; curved boundaries; solution of linear systems. Prereq: 3150 or 3155, and one 4000-level mathematics course. (Same as Computer Science 5455.) F

5466 Finite Elements Methods (3) Finite element techniques for solution of ordinary and partial differential equations. Prereq: one of 4425-35-45 or consent of instructor. (Same as Computer Science 5465.)

5475 Advanced Topics in Numerical Partial Differential Equations (3) Finite element methods for eigenvalue problems, IV problems, BV problems with singularities. Other topics, such as finite element methods, further study of finite difference methods, etc. at discretion of instructor. Prereq: 4545-65. (Same as Computer Science 5475.) Sp

5480-90 Mathematical Programming (3, 3) Optimization of functions or variables subject to constraints. Prereq: 3510, 4560 and 4530. W, Sp

5490 Galois Theory (3) Fields and their extensions, separable and normal extensions, algebraic closure, groups of automorphisms, fundamental theorem, solvability of equations, by radicals. Prereq or coreq: 5520.


5590 Theory of Rings (3) Direct and subdirect sums of rings, prime and maximal ideals; modules and rings of endomorphisms; radicals; Wedderburn-Artin structure theory. Prereq: 5520.

5610-20-30 Mathematical Methods in Physics (3, 3, 3) (Same as Physics 5610-20-30.) F, W, Sp

5640 Numerical Methods in Physics (3) (Same as Physics 5640.)


5710-20-30 Tensor Analysis (3, 3, 3) Absolute differentiable calculus in three-dimensional Euclidean space; differential geometry of curves and surfaces; applications to physics; extension to n-dimensional space. Prereq: Major in mathematics or physics. Must be taken in sequence.


5775 Convolutional Algorithms (3) (Same as Computer Science 5775.)

5810-20-30 Number Theory (3, 3, 3) Arithmetic functions, distribution of primes, Diophantine equations, approximation theory, Shnirelman density and
Mann's theorem, quadratic forms, Dirichlet's theorem, prime number theorem. Prereq or coreq: 5510 for 5810; 5520 for 5820.


5940-50-60 Applied Probability (3, 3, 3) Develop-ment of probabilistic techniques useful in applica-tions to queueing, inventory control, signal-theory, biological and physical sciences. Prereq:

5950-60-70 Partial Differential Equations (3, 3, 3) Advanced topics in classical and modern theoretical partial differential equations. Prereq or coreq: 5110-20-30 and 5210-20-30 or consent of instructor.


6570 Theory of Groups (3) Structure of groups, free groups, nilpotence and solvability, extensions and products, permutation groups, abelian groups. Pre-req: 5520.

6610-20-30 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equa-tions from advanced viewpoint. Topics from current literature. Subject matter varies according to in-terests and preparations of students. Prereq or coreq: 4610 or 4650, or 4510-20-30. 5110-20-30 or 5210-20-30 or consent of instructor.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups. Lie groups; transformation groups; topolo-gical lattices; relations in topological spaces; topolo-gical rings, fields, algebras. Prereq or coreq: 5910-20-30.

6910-20-30 Modern Topology (3, 3, 3) Technical background to current literature in topology. Topics vary from year to year.

6940-50-60 Introduction to Algebraic Topology (4, 3, 3) Homology, cohomology, and homotopy theories. Homology and cohomology groups, the Eilenberg-Steenrod axioms, cup and cap products, duality theory, homology and cohomology, higher homotopy groups, fiber spaces, spectral sequences. Prereq: 4160 and 6920.

6991 Seminar Analysis (1-3)

6992 Seminar Topology (1-3)

6993 Seminar Algebra (1-3)

6994 Seminar Foundations (1-3)

6995 Seminar Applied Mathematics (1-3) May be taken for S/NC or letter grade.

NOTE: Registration for seminars may be repeated with consent of department.

6000 Doctoral Research and Dissertation (3-15) P/NP only: E

6210-20-30 Functional Analysis (3, 3, 3) Topolo-gical vector spaces, Frechet spaces, bounded linear maps, seminorms, Banach-Schauder and Banach-Alaoglu theorems, weak topologies, Krein- Mills theorem, Banach spaces and their duals, Goldstein's theorem; distributions, weak derivatives, n-dimensional Fourier transforms, Paley-Wiener theorems, Sobolev spaces, theorems of Malgrange, Ehrenpreis and Lax; Banach algebras, Gel'fand transforms, Gel'fand-Naimark theorem; the spectral theorem for normal operators.


6450-60-70 Partial Differential Equations (3, 3, 3) Advanced topics in classical and modern theoretical partial differential equations. Prereq or coreq: 5110-20-30 and 5210-20-30 or consent of instructor.

6991 Seminar Analysis (1-3)

6992 Seminar Topology (1-3)

6993 Seminar Algebra (1-3)

6994 Seminar Foundations (1-3)

6995 Seminar Applied Mathematics (1-3)

6996 Seminar in Numerical Mathematics (1-3) NOTE: Registration for 6000-level courses may be repeated with consent of department.

Microbiology

MAJOR

DEGREES

Microbiology

M.S., Ph.D.

Professors:

A. Brown (Head), Ph.D. Chicago; R. W. Beck, Ph.D. Wisconsin; J. M. Becker, Ph.D. Cincinnati; R. J. Courtney, Ph.D. Syracuse; T. C. Morris, Ph.D. Maryland; J. C. Munir (Emeritus), Ph.D. Michi gan State; W. S. Rigsby, Ph.D. Yale; B. T. Rouse, Ph.D. Guelph; M. W. Woodward (Emeritus), Ph.D. Kansas; C. J. Wust, Ph.D. Indiana.

Associate Professors:

D. A. Brain, Ph.D., D.V.M. Michigan State; G. S. Sayler, Ph.D. Idaho.

Assistant Professors:

D. J. Sengel, Ph.D. Cornell; N. R. Moore, Ph.D. Texas (Austin); K. M. Silbofin, Ph.D. Michigan State; G. Stacey, Ph.D. Texas (Austin).

Lecturers:

H. F. Wold, Ph.D. Cornell; B. B. Bellomy, M.D. Georgetown; W. Farkas, Ph.D. Duke; C. L. Lazzio, M.D. Buenos Aires.

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.

3810 Food Bacteriology (3) Standard methods for examination, cultivation, and identification of bacte-ria associated with food fermentation and food spoil-age. Prereq: 2910 or 3700 and Chemistry 2230 or 3211. Sp

3819 Food Bacteriology Laboratory (2) Laboratory methods for examination, cultivation, and identifica-tion of bacteria associated with food fermentation and food spoilage. Prereq: 2919 or 3519. Coreq: 3810. Sp

3820 Yeast and Molds (3) Morphology, taxonomy, and principles of yeasts and molds. Prereq: 2910 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: 3700. Coreq: 4110. W

4130 Taxonomy of Bacteria (3) Bacterial classifica-tion. Prereq: 3700 and 3619. F

140 Molecular Genetics (3) Transmission and ex-pression of genetic information at the molecular level. Emphasis on bacterial and viral systems, but undergraduate features of genetic systems are included. Prereq: 3700 or consent of instructor. Sp

1419 Techniques in Microbial Genetics (2) Practi-cal experience in basic techniques in experimenta-tion in microbial genetics. Coreq: 4140. Sp

150 Microbial Ecology (3) Application of ecologi-cal 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

1589 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, hypersensitivi-ties, cell cooperation in immune mechanisms, abnor-malities of the immune system. Prereq: Biology 3120. (Same as Zoology 4270.) F

4275 Advanced Immunology Laboratory (2) Laboratory methods concerned to accompany 4270. Prereq or coreq: 4270. F

4320 Pathogenic Bacteriology (3) Disease produc-ing microorganisms including bacteria, rickettias, and chlamydia. Prereq: 3200. W
5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetic concepts (mutation, complementation, recombination) at molecular level. Studies of lactose operon of Escherichia 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) P/NP only. E

6310 Seminar in Immunology (1) Readings and discussions based on current literature. May be repeated. S/NC only. E

6320 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/NC only. F, W, Sp

6330 Seminar in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. S/NC only. F, W, Sp

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 of current literature. May be repeated with consent of department. 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

6370 Current Topics in Environmental Microbiology (2) Reading, 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 immunopathology.

6430 Current Topics in Immunochemistry (2) Reading, discussions, and critical evaluation of current literature. May be repeated with consent of department. S/NC only. E

6450 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.

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.

Music

MAJOR

DEGREES

M.M., M.A.

Professors:

J. A. Meacham (Acting Head), M. M. Northwestern; J. Coker, M.A. Sam Houston; G. F. DeVine, Diploma, Schurz (Chicago); W. Dorn, M.A. Columbus, H. F. Fred, Ph.D. North Carolina; R. C. Huber, Ph.D. North Carolina; D. M. Pederson, Ph.D. Iowa; E. H. Zambra, M.M. New England Conservatory.

Associate Professors:


Assistant Professors:


The Department of Music offers the degrees of Master of Music with concentrations in performance, composition, theory, choral conducting, instrumental conducting, Suzuki string techniques, and piano pedagogy and literature, and the Master of Arts with a major in Music with concentrations in theory and musicology.

Applicants for these degree programs must have completed an undergraduate degree approximately equivalent in music requirements to those required in degrees conferred by The University of Tennessee, Knoxville, appropriate to the prospective area of concentration on the Master's level. Applicants who plan to pursue the degree in performance (applied music) are required to audition before the appropriate area committee. Applicants for admission to the program in composition must submit scores and tape recordings of representative works. All applicants are required to take the Diagnostic Examinations in music theory and music history and literature.

General requirements for the Master's degree begin on page 16 of this catalog.

THE MASTER OF MUSIC PROGRAM

The department requires a minimum of 45 quarter hours of coursework for the Master of Music degree. These hours are specifically distributed according to the area of concentration. All areas require coursework in music history/literature and/or theory and allow for elective courses. Music theory and composition requirements will be established by the student's faculty committee.

THE MASTER OF ARTS PROGRAM

The department requires a minimum of 45 quarter hours including 21 hours of coursework above the 5000 level and 9 hours of thesis.

A reading knowledge of French or German must be demonstrated by candidates for the Master of Arts degree.

Specific course requirements will be prescribed by the department for all degree programs and elective courses must have the approval of the student's advisor.

3122 Orchestration (3) Advanced techniques in instrumental writing with emphasis on scoring for the concert orchestra. Prereq: 3112 or consent of instructor.

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 Voice (1-4)
**3560 Violin (1-4)
**3565 Viola (1-4)
**3570 Cello (1-4)
**3575 String Bass (1-4)
**3580 Piano (1-4)
**3585 Harpsicord (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.
4003-04-05 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: 2310-20-30-40 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.
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 (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 (1) Techniques literature, performance practice, continuo playing, and basic tuning and maintenance. Requires a thorough keyboard background. Prereq: Consent of instructor. May be repeated. Maximum 3 hrs.
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 scoring for the stage band. Prereq: 3112 and 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.
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.
4290 Gregorian Chant (3) Chants of Latin rite. Masses and Offices examined as functional music as well as by type.
4340-50 Works of Bach (3, 3) Detailed examination of sonatas, chamber, keyboard, and orchestral works; cantatas, motets, passions and oratorios. 4340—instrumental works; 4350—vocal works.
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)
**4555 Voice (1-4)
**4560 Violin (1-4)
**4565 Viola (1-4)
**4570 Cello (1-4)
**4575 String Bass (1-4)
**4580 Organ (1-4)
**4590 Guitar (1-4)
**4597 Composition with Electronic Media (1-3) Prereq: Consent of instructor.
**4599 Composition (1-3) Prereq: Consent of instructor.
4640 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz and administering of jazz programs. Prereq: Enrollment in Applied Music with jazz emphasis or consent of instructor.
4850 Jazz Composition (3) Prereq: 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) P/N only. 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.
5012-23-32 Pedagogy of Voice (2, 2, 2) 5012—Survey of voice production processes in singing including: voice classification, quality, diction registration, 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.
5020 Piano Literature Seminar (3) Topics vary.
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: 2055-25-75 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/N only.
5057 Instrumental Conducting Seminar (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 4050 or equivalent.
5060 Seminar in Choral Performance (3) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 4060 or equivalent.
5061 Choral Conducting (3) Development of choral conducting skills.
*5070 Opera Production (1-3) Prereq: Consent of instructor.
**May be repeated. Maximum 6 hrs.
*May be repeated.
4310 Intermediate Ethics (4) Topics in metaethics and pragmatism. Prereq: 3810 or equivalent. [Same as Religious Studies 4370.]

4420 Aristotle (4) Prereq: 8 hrs philosophy or consent of instructor. A

4450 Continental Rationalism (4) Prereq: 8 hrs philosophy or consent of instructor. A

4460 British Empiricism (4) Prereq: 8 hrs philosophy or consent of instructor. A

4470 Kant (4) Prereq: 8 hrs philosophy or consent of instructor. A

4480 Advanced Topics in Existentialism and Phenomenology (4) Prereq: 8 hrs philosophy or consent of instructor.


4511 Advanced Topics in Logic (4) Prereq: Consent of instructor. May be repeated.

4620 Philosophy of Mind (4) Problems of mind and body in relation to consciousness and personal identity. Prereq: 8 hrs philosophy or consent of instructor.

4630 Philosophy of Language (4) Prereq: 8 hrs philosophy or consent of instructor.

4710 Philosophy of Natural Science (4) Examination of standard topics pertinent to natural science including reduction of theories and teleological explanation. Familiarity with symbolic logic is recommended. Prereq: 3770 or 2 yrs natural science.

4720 Philosophy of Social Science (4) Examination of methods of inquiry and modes of explanation in social sciences. Prereq: 3770 or 2 yrs social sciences.

4810 Metaphysics (4) Prereq: 8 hrs philosophy or consent of instructor. A

5000 Thesis (1-15) P/NP only. 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

5050 Symbolic Logic (4)

5080 Philosophy of Logic (4) Nature of logic; epistemological, metaphysical and axiological assumptions and implications in various theories of logic. Prereq: 4510 or equivalent.

5101 Foreign Study (1-12) See page 96. E

5102 Off-campus Study (1-12) See page 96. E

5103 Independent Study (1-12) See page 96. E

5110-20-40-50-60 Studies in the History of Greek, Latin, and Medieval Philosophy (4, 4, 4, 4, 4, 4) Intensive critical work on major philosopher or school. 5110—Greek, 5120—Hellenistic or Medieval, 5130—Modern, before Kant, 5140—Kant, 5150—Nineteenth Century, 5160—Twentieth Century.

5290 Studies in the History of American Philosophy (4) Intensive, critical work on major philosopher or school.


5355 Orientation to Medical Ethics (2) Survey of ethical theories in application to issues in medical ethics. Consent of Medical Ethics Committee required. (Same as Religious Studies 5355.) F

5365 Applied Ethical Theory (4) Single author, tradition, or topic in ethical theory with special attention to application to issues in health, business, technology, ecology, and other practical fields. (Same as Religious Studies 5365.) W

5370 Topics in Medical Ethics (4) Prereq: 4370 or consent of Medical Ethics Committee.

5375 Clinical Medical Ethics (1) Medical terminology, history of medical ethics, case study discussions, clinical observation. Open only to students concentrating in medical ethics. Prereq: 5355 and consent of Medical Ethics Committee. May be repeated. Maximum 8 hrs. S/NC only.

5410 Philosophy of History (4) Theories of history and historical processes.

5430 Philosophy and Literature (4) Mutual influence of philosophy and literature, possibility of a philosophy of literature, philosophy of criticism.

5450 The Problem of the Self (4) Current studies in sociology, social psychology, and philosophy to appraise and elucidate traditional philosophical treatments 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.


5610 Recent Developments in Philosophy of Religion (4)

5710 Studies in Metaphysics (4) Metaphysics of philosopher 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) P/NP only. E

6110-20-30 Seminars in the History of European Philosophy (4, 4, 4)

6150 Seminars in the History of American Philosophy (4)

6250 Seminar in the Philosophy of Religion (4)

6310 Seminar in Axiology (4)

6370 Advanced Topics in Medical Ethics (4) Prereq: 5370 or consent of Medical Ethics Committee.

6510 Seminar in Epistemology (4)

6650 Seminar in Philosophy of Science (4)

6850 Advanced Residence in Medical Ethics (4-12) Prereq: Consent of Medical Ethics Committee. Open only to students concentrating in medical ethics. S/NC only.

Physics and Astronomy

MAJOR

DEGREES

Physics

M.S., MACT, Ph.D.

Professor: W. M. Bug(Head), Ph.D. Tennessee; W. Bingham, Ph.D. Tennessee; W. E. Blass, Ph.D. Michigan State; M. A. Brazeale, Ph.D. Michigan State; T. A. Callcott, Ph.D. Purdue; L. G. Christoforou, Ph.D. University of Manchester (England); G. T. Condo, Ph.D. Illinois; W. E. Deeds, Ph.D. Ohio State; J. B. Dicks, Ph.D. Vanderbilt; J. L. Fowler, Ph.D. Princeton; K. Fox, Ph.D. Michigan; N. M. Gainer, Ph.D. Ohio State; E. G. Harris, Ph.D. Tennessee; E. L. Hart, Ph.D. Cornell; P. G. Huray, Ph.D. Tennessee; D. T. King, Ph.D. Bristol University (England); R. J. Lovell, Ph.D. Vanderbilt; A. A Mason, Ph.D. Tennessee.

1Alumni Distinguished Professor.

2Space Institute, Tuscaloosa.
colleges or universities on the elementary or intermediate level, prior 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 30 hours from courses numbered above 5000, 9 hours in a minor field (e.g., mathematics), and 6 hours from other courses in physics numbered above 5000 (preferably of advanced laboratory nature). 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, making a total of 60 quarter hours. Nine of these hours are specified as follows: 3 hours in a seminar course dealing with general problems of college teaching; 3 hours in a seminar course dealing with special problems in the teaching of physics; and 3 hours in a course dealing with the history and philosophy of physics. The other 6 hours of course work may be elected from any of the physics courses numbered above 5000.

During the two-year program leading to the MACT degree, the candidate will be continually engaged in supervised teaching activities.

THE DOCTORAL PROGRAM

All students are expected to take 5210-20-30, 5310-20-30, 5410-20-30, 5510-20-30, 5610-20-30, 6110-20-30 and 6310. Physics 6210-20-30 are normally required of students specializing in nuclear physics, Physics 6500-10 of students in plasma physics, Physics 6610-20-30 of students in solid state physics, and Physics 6810-20 of students specializing in molecular spectra. (The Master's degree is not required for the above.)

A reading knowledge of one foreign language in which there exists a significant body of literature is required. German or French 3030 with a grade of A or B may be substituted for the corresponding language examination.

The thesis topic will be chosen with reference to one of the fields in which research facilities can be made available either at the University laboratory or at the Oak Ridge National Laboratory, Oak Ridge, Tennessee.

A program leading to the Ph.D. in chemical physics is conducted jointly with the Chemistry Department, with a similar degree. Physics departmental requirements for the degree in chemical physics include the successful completion of: Physics 4510, 4610-20-30, 5310-20-30, 5410-20-30, 5510-20-30, 5610-20-30, 6110-20-30, 6310, 5710, 5720; Chemistry 4160-70, 5430, and any two quarters from 5340-50, 6730 or 6610-20-30.

Astronomy

4110-20-30 Astrophysics (3, 3, 3) Physics of stars and interstellar matter, planets and interplanetary matter; atmospheres, interiors, and evolution; nebulae, quasars, pulsars. Observational data and their determination. One and a half lab. Prerequisites: Mathematics 3120 and consent of instructor. Acceptable for major credit in physics. PreReq: Physics 2330 and consent of instructor.

Physics


3230 Heat and Thermodynamics (3) Concepts of heat and heat; laws of thermodynamics; applications of laws to simple physical and chemical problems. PreReq: 2310 or 2210-20-30 and calculus. 3210-20 or consent of instructor. Sp, Su.

3610-20 Electronics (3, 3) Electronic components and circuits of interest to physicists. PreReq: 2310-20-30 or 2210-20-30 and calculus. 3 labs. F, W, Su.

3630 Nuclear Electronics Laboratory (3) Elementary circuits of interest in nuclear instrumentation are designed and built, and their characteristics are tested as a function of various parameters. PreReq: 3610-20.

3710-20-30 Introduction to Atomic and Nuclear Physics (3, 3, 3) 3710—Special relativity and early quantum theory. 3720—Atomic and molecular physics. 3730—Nuclear physics. PreReq: Mathematics 2860; 3210 for 3710; 3230 for 3730. F, W.


4140 Elementary Nuclear Physics (3) General properties of nuclei, two-nucleon systems, nuclear forces, nuclear models, nuclear reactions, nuclear disintegrations and beta-decay, nuclear spin and magnetism. PreReq: Mathematics 2860.

4160 Physical Acoustics (4) Considerations fundamental to detailed investigation of any branch of acoustics; propagation of acoustic waves in the infrasonic, the audible, the ultrasonic, and the supersonic ranges of frequencies. PreReq: 3210-20, 3230. 3 hrs and 1 lab. Sp.

4210-20-50 Electricity and Magnetism (3, 3, 3) Intermediate level electrodynamics; statics and alternating currents; electromagnetic fields and their equations; radiation of electromagnetic waves; reflection and refraction; electromagnetic fields of moving charges. Must be taken in sequence. PreReq: 2320 or 2220 and Mathematics 2850. F, W, Sp, or W, Sp.

4230-40 Modern Optics (4, 4) 4230—Geometrical Optics: Reflection and refraction of light at a dielectric interface, paraxial theory of interfaces, lenses, and mirrors; thick lenses, lens systems, ray tracing; polarization; imagery; light theory. 4240—Physical Optics; Mathematics of wave motion, superposition of waves; interference, Fraunhofer and Fresnel diffraction; Fourier optics, holography. PreReq: 4210 or consent of instructor. 3 hrs and 3 hrs lab. W, F.

4510-20-30 Atomic Physics Laboratory (3, 3, 3) Experiments in: fundamental particle properties, photoelectricity, conduction of electricity through gases, atomic and molecular spectroscopy, x-ray. PreReq or coreq: 3710-20-30. 3 labs. F.

4540-50 Experimental Nuclear and Radiation Physics (4, 4) Interaction of charged particles and electromagnetic radiation with matter; theory and characteristics of various detectors; statistics of counting and random counting. Experiments counting recent techniques for investigating the nucleus and nuclear radiation. PreReq: 2330. 1 hr and 6 hrs lab. F, Su.
5480 Principles of Nondestructive Testing (3) Detection and characterization of discontinuities in materials by nondestructive physical measurements. Units of detection, geometric, holographic, and radiographic techniques are discussed. Prereq.: 2310-20-30 or consent of instructor. (Same as Engineering 2310-20-30.)


5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required to complete 5000-31 Special Problems in the Teaching of Physics. May not be used toward degree requirements. May be repeated. S/N/C only.

5080 Graduate Research Participation (3) Advancement of students in many techniques under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students and postdoctoral students. Consent of department and research director. May be repeated with consent of department. S/N/C only.


5210-20-30 Advanced Modern Physics (3, 3, 3) Basic principles of wave mechanics; one-electron atom; vector model; atomic and molecular spectroscopy; molecular bonding; relativistic effects; nucleon properties of nuclei; spin, magnetic moments, etc.; scattering phenomena; nuclear models and forces; high-energy physics. Prereq.: 3210-20, 3710-20-30, 4210-20; differential equations. Must be taken in sequence. F, W, Sp.


5440 Experimental Methods of Infrared and Raman Spectroscopy (3) Experimental equipment; instrumental optics; detection systems; analytical methods. Analysis of diatomic molecule. Prereq.: 3710 or equivalent.


5640 Numerical Methods in Physics (3) Numerical methods available for solution of physical problems, pointed toward use of automatic computing machinery; analysis of errors. Prereq.: 5610-20-30, or consent of instructor. (Same as Mathematics 5640.)

5729 Physics of Polytatomic Molecules (3) Introduction to electronic structure of molecules and physical processes of luminosities of these molecules; theoretical and experimental aspects of intermolecular and intramolecular electronic excitation energy transfer and charge transfer; application of excitation energy transfer and charge transfer in such field as organic molecular reactivity and organic spectroscopy. Prereq.: 5210-20 or consent of instructor.

5610-20-30 Special Problems (3, 3, 3) Specially assigned theoretical or experimental work on problems not covered in other courses. E.

5990 Seminars (1-3) A. Mechanics; B. Radiation; C. Heat and Thermodynamics; D. Electricity and Magnetism; E. Theoretical-Experimental; F. Independent study; consent of instructor. Open to all graduate students. Consent of department and research director. May be repeated with consent of department. Maximum 27 hrs. E.

6000 Doctoral Research and Dissertation (3-15) P/N/P only. E.

6110-20-30 Quantum Mechanics (3, 3, 3) Fundamental principles of quantum mechanics and principal approximation methods. Applications to atomic, molecular and nuclear physics. Dirac equation; quantum electrodynamics. Prereq.: 4130 or 5210; 5310-20-30 or 5410-20-30. Whichever of these series most closely resembles the pupil is considered requisite. F, W, Sp.


6310 Electromagnetic Theory of Light (3) Classical electron theory including theories of the breadth, dispersion and absorption; scattering of light and x-rays; dielectric and magnetic properties of gases and solids. Optical properties of electromagnetic waves in isotropic media including reflection, refraction and polarization and also theory of diffraction. Prereq.: 5410-20-30 Su.

6320 Special Relativity (3) Lorentz transformation; Einstein postulates; relativistic tensors; relativistic mechanics; relativistic electrodynamics. Prereq.: 5310-20-30, 5410-20-30, 6310. F.

6330 General Relativity (3) Tensor calculus; general theory of relativity; gravitational field equations. Prereq.: 6320. W.

6420 Advanced Topics in Classical Theory (3) To meet special needs of students. Possible topics: advanced dynamics and hydrodynamics, electromagnetic theory, statistical mechanics, potential theory, theory of radiation, elastic and magnetic susceptibilities, high energy processes, scattering and correlation processes, theory of fields. Prereq.: 5110-20-30. May be repeated with consent of department.

6590-10 Electromagnetic Conduction in Gases and Plasma (3, 3, 3) Conduction mechanisms, low and high pressures. Characteristics of a plasma, plasma oscillation; magnetohydrodynamics; instabilities. Topics of current interest in astrophysics; geophysics and thermonuclear research. Prereq.: 3710-20-30 and either 5410-20 or Electrical Engineering 5310-20-30. (Same as Electrical Engineering 6400-10.) F; W.

6610 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, excitation and light emission. Electron interaction, transport and capture; electron swarm and electron beam experiments. Prereq. or coreq.: 6110-20-30.

6620 Interaction of Electrons with Solids (3) Collision processes; stopping power; slowing down spectra; energy straggling; nuclear scattering; electron diffusion; plasmon effects in irradiated solids; secondary electron emission; electron spectroscopy; applications to dosimetry. Prereq. or coreq.: 6110-20-30. W.


6710-20-30 Advanced Solid State Physics (3, 3, 3) Lattice dynamics; phonons; Brillouin zones; heat capacity. Energy band structure of solids; cohesive energy, work function. Crystal oscillator strengths; effective mass approximation. Dia-, para-, and ferromagnets; neutron scattering; applications of magnetic fields. Prereq. or coreq.: 4630, 5210-20. Prereq. or coreq.: 4630; 6110 for 6710, 6120 for 6720. A.

6810 Vibrational Problems in Molecular Spectra (3) Spectroscopy of gases, solids and solutions; group theory; group theoretical methods and selection rules in gases and condensed phases. Laser beam spectroscopy and nonlinear optics. Prereq. or coreq.: 5420 or equivalent. (Same as Chemistry 6810.)

6820 Molecular Vibration-Rotation Theory (3) Molecules as vibrating and rotating systems possessing classical and quantum symmetries. Generalized mechanical theory of symmetric and asymmetric molecular vibrators including vibration-rotation interaction theory; intensities and energies of molecular vibrational and rotational transitions; methods of analysis used in high resolution molecular spectroscopy. (Same as Chemistry 6820.)

Political Science

MAJORS

DEGREES

Political Science

M.A., Ph.D.

Public Administration

M.P.A.

Professors:

M.A., Ph.D.

Public Administration

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 centuries. W

3880 American Political Thought (4) Examination of role of selected political ideas, doctrines, and themes in America, emphasizing their development and relationships to diverse political interests. F

4060 Revolution: Characteristics, theories, and consequences of revolution, with particular focus on left-wing revolutions and movements. Sp

4110 Law and the Administrative Process (4) Powers of, procedures of, controls over administrators. Sp

4535-38 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


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.

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

4655-56 Policy Making in Democracies (4, 4) Comparative approach to theory and process of making public policies. F or Sp; W

4675 Special Topics in Comparative Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.


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. F, A

4740 Political Parties and Elections (4) Analysis of party systems and electoral process. F, W

4750 Political Campaigns (4) All aspects of campaign process. F, W

4940 Politics and the Environment (4) Examination of interaction and/or implementation of public policies relating to physical environment with emphasis upon water and air pollution control. Sp

5000 Thesis (1-12) P/ NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during the quarter such that 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 96. E

5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E

5110-20 Seminar in Political Theory (3, 3) Selected topics in 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 (2-9) Open to students participating in approved internship programs. May be repeated with consent of instructor. Maximum 9 hrs. May be taken for letter grade or S/NC. E

5210-20 Seminar in World Politics (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 9 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 governments. F

5340-50 Seminar in Latin American Government (3, 3) J. A. Wiberley.


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, 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) J. M. Barlow. Prereq: Consent of instructor. May be repeated.

5520-30 Seminar in Comparative International Organizations (3, 3) Research into selected topics. W, Sp

5541 Seminar in Contemporary Public Policies (3, 3) Scenarios in modern governments. F

5542 Seminar in Comparative Public Administration (3) Approaches to and methods used in comparative analysis.

5550 Seminar in Administration in Developing Countries (3) W. H. Calhoun.

5600 Public Administration (3) Public administration theory and functions, approaches to public management, contemporary problems in public administration. F

5630 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and reporting of data. W

5640-50 Seminar in Metropolitan Areas (3, 3) T. P. Cohen.

5641 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. F

5730 Seminar: Public Budgeting (3) Technical and political aspects of planning, preparing, and adopting government budgets. W

5735 Seminar: Public Financial Management (3) Management of public expenditures and management implications of revenue collection, debt management, treasury function, accounting, internal auditing, purchasing, risk management, post-auditing. W

5740 Seminar in Organizational Analysis (3) Organization theory applications in public management; field analysis of public organizations. Sp

5750-55 Seminar in Public Management (3, 3) Selected problems. F; W

5765-75 Law and the Administrative Process (3, 3) Constitutional position; decisional processes, regulation and management; limitations on government action; questions of structure, role, and administrative choice. W

5770 Practicum in Public Administration (3) Practicum in public administration for 8 credits. W

5785-95 Seminar in Staff Functions (3, 3) Functions of administrative staff personnel serving political, public, private and voluntary organizations. W

5790 Seminar in Public Personnel Management (3) Functions and organizations 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 organization of public administration. F

5840 Ethics, Values, and Morality in Public Administration (3) Moral-ethical-value dilemmas confronting administrators in American political system. F

5850 Seminar in Comparative State Politics (3) Research readings in comparative state politics focusing on environment of state politics, institutions and policy making. W

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. Sp

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6210 Advanced Studies in International Politics (3) E. D. Sundstrom, P/NP only. E

6310 Advanced Studies in Political Theory (4) Research into selected topics. F

6410 Advanced Studies in International Organization (3) Research in selected topics. W

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 relationships, civil liberties, courts in political setting, judicial institutions, personnel, and public policy content. F

6610-20 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 graduate students upon approval of instructor. F; W

Psychology

MAJOR

DEGREES

Psychology

M.A., Ph.D.

Professors:


Associate Professors:


Assistant Professors:


The Psychology Department emphasizes the Doctoral degree and graduate internships in clinical, school, community, social, developmental, experimental, cognitive, physiological, and comparative psychology, psycholinguistics, psychometrics, and learning. Some students complete a Master's degree as part of their doctoral program.

For detailed information on graduate programs and admissions requirements write: Graduate Secretary, Department of Psychology, University of Tennessee, Knoxville, Tennessee 37996-0900.

THE PSYCHOLOGICAL CLINIC

The Psychological Clinic supports graduate training in clinical psychology. Psychological diagnosis and psychotherapy are offered on an outpatient basis, with medical consultants, to the general public as well as to University students, on referral by a physician.

3720 Ethology and Sociology (3) Evolutionary approach to behavior with special reference to controversial issues in applications to psychology, social sciences, and arts.

4107 Experience in Individual Instruction (1-4) Experience as proctor in individualized instruction. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. S/NC only. E

4230 Sensory Processes and Perception (4) Survey of sensory and perceptual processes with emphasis on audition and vision. Prereq: 3150. Recommended: 2520. F

"Part-time.

ACADEMIC REQUIREMENTS
4239 Laboratory in Sensory Processes and Perception (2) Prereq or coreq: 4230.

4460 Organizational-Industrial Psychology (3) Cannot be taken for credit by students who have credit for Management 3460. E

4510 Personality Theories (4) Prereq: 3650 or consent of instructor: F, Su

4520 Personality and Social Systems (4) Prereq: 2550.

4610 Group Processes (3) Study and experience of theory and techniques of group process and facilitating. Those participating in 4610 are expected to continue in 4620 and 4630. Prereq: 3616-26 and consent of instructor: F, W, Sp

4620-30 Seminar in Group Processes (3, 3) Didactic and laboratory experience for those qualified for further training as group facilitators. Prereq: 4610 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 mental ability, 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.

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 2320. 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 development biological principles 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.)

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) P/NP only; E

5002 Non-thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required 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

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 the department, psychological 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.


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 5130.) F, Sp, Su

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 dealing with atypical or deviant sexuality. Historical, psychological, social work, and community and mental health professions. Prereq: Consent of instructor.

5111 Seminar in Current Issues in School Psychology (3) Historical, legal, ethical and technological issues in practice of school psychology. Multiple instructors. (Same as Educational Psychology 5111.) S/NC only. F

5140-50-60 Psychoeducational Assessment (3, 3, 3) Naturalistic, psychometric, and sociometric assessment methods in school learning environments. Must be taken in sequence. Prereq: Admission to School Psychology program or consent of instructor. (Same as Educational Psychology 5140-50-60.) F, W, Sp


5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 5170-80-90.) F, W, Sp

5200 Topics in Developmental Psychology (3) Prereq: 5100 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs.

5300 Readings and Special Problems in Psychology (1-5) May be repeated. Maximum 20 hrs. S/NC only.

5319 Field Work in School Psychology: Level I (2) Supervised on-the-job training in school psychology. Limited to students fully admitted to doctoral program in school psychology who are assigned to program approved field settings. Prereq: 5140-50-60 or equivalent. May be repeated. Maximum 6 hrs. (Same as Educational Psychology 5519.) S/NC only. F, W, Sp

5325 Behavioral Interventions (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Focuses on interventions by people in community settings. Includes token economies and strategies for self-control.

5340 Group Dynamics (3) (Same as Educational Psychology 5340.)

5350-60-70 Seminar in Psychology (3, 3, 3) May be repeated. Maximum 18 hrs.

5400 Psychophysics and Scaling Methods (3) Prereq: One course in statistics.

5420-30-40 Advanced Psychological Statistics (3, 3, 3) Must be taken in sequence. W, Sp; Su; F

5450 Human Problems in Administration (3) (Same as Management 5230.)

5490 Continuing Education in Mental Health (1-4) Topics of interest to persons in mental health and allied fields. Workshop, seminar, or lecture, topic and format to be announced. Prereq: Graduate standing or consent of instructor. May be repeated. Maximum 6 hrs.

5500 Fundamentals of Psychometrics (4) Basic ideas and orientation in psychometrics. All graduate students who plan to take one or more courses in psychometrics required to take course. Prereq or coreq: 4640.

5510 Instrumentation for Psychological Research (3)

5520 Theory of Mental Measurement (3) Reliability, validity, scaling and equating, norms, combining test scores, and reliability and validity of different populations in specific psychological parameters. Individual choice behavior and testing of psychological hypotheses in human and animal behavior; probability theory and statistical theory. Prereq: 1 qr calculus or 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 9 hrs.

5580 Theories of Personality (3)

5581 Psychodynamic Approach to Clinical Psychology (3) Basic concepts. Selected theories with examples of work with patients. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5582 Behavioral Approach to Clinical Psychology (3) Basic concepts and techniques of adult assessment, including intelligence tests and personality tests. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5584 Developmental Psychology (3) Normal development and psychopathology, emphasis on existential theory. Comparison of underlying assumptions of different theories. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5589 Adult Psychological Assessment (3) Basic concepts and techniques of adult assessment, including intelligence tests and personality tests. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5591 Seminar in Object Relations Theory (3) Biographical and American concepts of normal and psychopathologic development of object relations, practical significance for psychotherapy and psychoanalysis. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5592 Descriptive Psychopathology (3) Diagnostic criteria of the DSM-III. Examples from written case histories and recorded interviews. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5593 Dynamics of Psychopathology (3) Psychodynamic view of major symptoms of major psychoses, neuroses and adjustment disorders. Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.

5594 Developmental Assessment (3) Historical and theoretical development of psychological assessment methods. S/NC only. F
5610-20 Psychology of Learning (3, 3) Prereq: 3210 or Educational Psychology 3750. 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) Psychological role in legal system: role of law in society, legal standards and procedures, legal and ethical issues, and psychopathology 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 major classes of drugs, including their impact on psychology. Prereq: Consent of instructor. Sp, A
5702 Community Psychology (3) Psychological aspects of research, evaluation, intervention, and planning in communities. Community ecology, systems for primary and secondary prevention, planning of social systems, and relevance of federal policies. Prereq: Consent of instructor.
5712 Learning Modules for Techniques in Professional Psychology (1-4) Set of learning packages; each develops skills in assessment, technology, child evaluation, or psychology. Consent of instructor. May be repeated. S/NC only.
5750 Ethological Psychology (2) Evolutionary and physiological basis of comparative psychology and implications for human behavior. Prereq: Introduction to psychology. Lecture and laboratory dealing with structure and function of central and peripheral nervous system. Prereq: 4710, 4719, or consent of instructor. (Same as Zoology 5760.)
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. (Same as Zoology 5760.)
5769 Advanced Techniques in Physiological Psychology (3) Animal and human laboratory procedures central to research in physiological psychology. Prereq: 4710 or 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 Child Psychological Assessment (3) Introduction: behavioral observations, interviews, objective tests, projective techniques. Prereq: 5100 and Admission to Clinical Training Program or consent of instructor.
5859 Practicum in Psychological Appraisal (2) Prereq: Consent of instructor.
5860 Interpersonal Assessment (3) Focus on objective tests such as MMPI and Leary System of interpersonal diagnosis. Prereq: 5580 or equivalent and admission to Clinical Training Program or consent of instructor.
5869 Practicum in Psychological Assessment (3) Prereq: Admission to doctoral program in Clinical Psychology or consent of instructor.
5870 Projective Techniques in Assessment (3) Diagnosis of psychological disorders using case history and mental status; projective techniques. Prereq: 5601 or equivalent and admission to Clinical Training Program or consent of instructor.
5879 Practicum in Psychological Assessment (3) Prereq: 5869.
5890 Counseling Theories and Techniques (3) (Same as Educational Psychology 5890.)
5950-60 Theory and Practice of Consultation (3, 2) Issues in consultation, models of consulting process and evaluation of consulting techniques. Must be taken in sequence. Coreq: 5959-69 and consent of instructor. (Same as Educational Psychology 5950-60.) W, Sp
5959-69 Practicum in Psychological Appraisal (2, 2) Coreq: 5850-00-70. Prereq: Consent of instructor. Must be taken in sequence. (Same as Educational Psychology 5959-69.) S/NC only. W, T, F
6000 Doctoral Research and Dissertation (3-15) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs. S/NC only.
6090 Internship in Psychological Assessment (1-6) Supervised employment at departmentally approved internship site. 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.
6150 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: 5702 and 5712.
6210-20 History, Systems, and Theories in Psychology (3, 3, 3) Prereq: M.A. in psychology or equivalent. Must be taken in sequence.
6250-60 Seminar in Industrial and Organizational Psychology (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) Prereq: 5660. (Same as Psychology 6310.)
6319 Field Work in School Psychology: Level II (2) Supervised on-the-job traineeship in school psychology. Limited to students fully admitted to doctoral program in School Psychology assigned to program approved field settings. Prereq: 5850-60. May be repeated. Maximum 6 hrs. (Same as Educational Psychology 6319.) S/NC only. F, W, Sp
6320 Seminar in Research Methods (3) Prereq: Consent of instructor.
6340 Seminar in Developmental Psychology (3) Prereq: Consent of instructor.
6350 Seminar in Thinking (3) Prereq: Consent of instructor.
6360 Seminar in Sensation and Perception (3) Prereq: Consent of instructor.
6370 Seminar in Theoretical Psychology (3) Prereq: Consent of instructor.
6380 Seminar in Industrial and Organizational Psychology (3) (Same as Management 6380.)
6385 Hypnosia and Imagery (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 in Changing Concepts in Clinical Psychology (3) New developments in 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 Psychotherapy (2, 2) Theories and principles. Prereq: Consent of instructor.
6411 Seminar in Group Processes (2) Theory and practice of group therapy, communication skills. Prereq: Admission to Clinical Training Program or consent of instructor.
6412 Seminar in Inference in Psychotherapy (3) Uses of actuarial and inferential data for assessment of strategies and tactics used in psychotherapy. Prereq: Admission to the Clinical Training Program or consent of instructor.
6413 Seminar in Techniques of Behavior Modification (2) Practical applications of systematic desensitization, operant conditioning, aversive conditioning and related techniques for modification of behavior disorders. Prereq: Admission to the Clinical Psychology Program.
6414 Seminar in Marital and Family Therapy (2) Evaluating marital and family problems; methods of investigation. Psychodynamic, behavioral, and systems-theory concepts. Prereq: Admission to the Clinical Psychology Program.
6450-60 Advanced Psychometrics (3, 3) Construction and standardization of psychological tests, item and scale theories, and methodology of the design of psychological tests and measurements; item analysis, scaling, equating, and norms development. Prereq: 4650, 5440, and 5500. May be repeated. Maximum 9 hrs.
6490 Continuing Education in Professional Mental Health (1-4) Topics of interest to persons in mental health and allied fields. Workshop, seminar, or lecture, topic and format to be announced. Prereq: Professional degree or commitment to mental health or consent of instructor. May be repeated. Maximum 9 hrs.
6491 Off-Campus Placement in Clinical Psychology (1-4) Required of all students on placement by Clinical Training Program. May be repeated. Maximum 24 hrs. S/NC only.
6492 Psychology Clinic Placement (1-4) Required of students assigned to Psychology Clinic. May be repeated. Maximum 24 hrs. S/NC only.
6493 Psychology Clinic Activity (1-4) Continuation beyond 6439. May be repeated. Maximum 12 hrs. S/NC only.
6494 Field Experience in Clinical Psychology (1-4) For students who have finished internship with placement in clinical psychology in local area. May be repeated. Maximum 12 hrs. S/NC only.
6550 Seminar in Psychometrics (3) Seminar for advanced graduate students in psychometrics or quantitative psychology. Prereq: Beyond 6439. May be repeated. Maximum 24 hrs. S/NC only.
6559 Seminar in Advanced Social Psychology (3) Prereq: Consent of instructor.
6575 Seminar in Mental Health Administration (3) Theory and problems in organization and management of mental health administration.
6575 Seminar in Mental Health Administration (3) Seminar on current topics: ecological psychology, quality-of-life, social impact assessment, and environmental classification. Prereq: Consent of instructor.
6702 Social Ecology (3) Seminar on current topics: ecological psychology, quality-of-life, social impact assessment, and environmental classification. Prereq: Consent of instructor.
3660 Buddhist Philosophy and Religion (4) (Same as Philosophy 3660.) W
3671 Religion and Philosophy in China (4) (Same as Philosophy 3671.) W
3690 Philosophy of Religion (4) (Same as Philosophy 3690.) W
4111-21 Modern Religious Philosophies (4, 4) Examination of the religious implications of major thinkers and movements. Prereq: 4111—Nicolas of Cusa to Hume. 4121—Kant and the nineteenth century. Prereq: 9 hrs of philosophy other than logic. (Same as Philosophy 4112.)
4200 Classical Indian Systems of Philosophy: The Moksha Tradition (4) Original writings and philosophical problems of the traditions of Samkhya, Yoga, and Vedanta. Prereq: 3650 or 3660. (Same as Philosophy 4200.)
4210 Topics in Ancient Israelite and Ancient Near Eastern Religions (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 figures, movements, and problems in American religious 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 8 hrs.
4540 Social and Religious Change (4) (Same as Sociology 4540.)
4610 Topics in Western Religious Thought and Institutions (4) Selected figures, issues, and institutions. 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 Religions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.
4670 Topics in Eastern Religions (4) Selected figures, issues, and institutions. Seniors and graduate students only, except by consent of department. Prereq: 3500-50-76. May be repeated. Maximum 12 hrs.
4810-20-30 Readings and Research in Religious Studies (3-4, 3-4, 3-4)
4840 Readings in Selected Languages Related to Religious Studies (3-4, 3-4, 3-4)
4940 Sociology of Religion (4) (Same as Sociology 4940.)
4950 Theory of Religion (4) Elements for construction of a theory of religion drawing on resources from fields of psychology, social psychology, sociology of religion, cultural anthropology, theology and comparative religion.
4950 Tradition, Change and Modernity in Asia (4) Comparative study of processes of religious and social change in historical context in Asian societies. Comparative focus of course will vary each year (e.g., China and Japan, India and South Asia). May be repeated. Maximum 8 hrs.
5101 Foreign Study (1-12) See page 96.
5102 Off-Campus Study (1-12) See page 96.
5103 Independent Study (1-12) See page 96.
5310-20 Topics in Religion and Society (4, 4)
5355 Orientation to Medical Ethics (2) (Same as Philosophy 5355.)
be numbered above 5000 and the rest above 4000, and should represent a meaningful complement to the student's area of concentration. In addition 9 hours of courses above 4000 in a related discipline are required. In special cases the latter requirement may be waived in favor of additional course work in the major field.

**Language Requirements:**

Students are expected to demonstrate written and oral fluency in Spanish as well as knowledge of two other foreign languages. One of these must be French; the second one should be chosen from such languages as German, Italian, Portuguese, Arabic or Hebrew in accordance with the student's field of concentration. Proficiency in Latin shall be required of all students specializing in an area related to philology or the medieval period.

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 shall 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 doctorate 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; Su

4001-02-03 Introduction to Consecutive and Simultaneous French Translation (3, 3, 3) 4001—Oral translation into English; 4002—Consecutive translation to and from English; 4003—Simultaneous translation to an from English. Training of students with intermediate or advanced knowledge of French for consecutive and simultaneous oral translation from French into English, and vice 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

4110-20-30 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. F

4230 Advanced Grammar (3, 3) Prereq: 2130, 2520, or equivalent. W; Sp

4250 Introduction to Descriptive Linguistics (3) Phonology, morphology, and syntax. Types of languages, linguistic groups, dialects and dialect geography. Application of descriptive linguistics—field linguistics, dialect study; its practical use in learning languages and in language teaching. Introduction to transformational grammar. Prereq: 9 hrs of upper division English or French 2010-20-30, 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 4260.) F

4260 Introduction to Historical and Comparative Linguistics (3) (Same as German, Russian, Spanish and Linguistics 4260.) 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

4350-60-70 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

4710-20-30 French Literature of the Twentieth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

5000 Thesis (1-15) P/NP only. E

5052 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 exegesis de texte. F

5101 Foreign Study (1-12) See page 96. E

5102 Off-campus Study (1-12) See page 96. E

5103 Independent Study (1-12) See page 96. E

5110-20-30 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 16th 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 ma d[u] siècle."

5470 Baudelaire and the Symbolists (3) Les Fleurs du mal and Petits poèmes 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 forms in composition, sketches, and original stories.

5670 Problems in Linguistics: Romance Languages (3) Topics vary. Prereq: 4250 or consent of instructor. May be repeated. Maximum 6 hrs with consent of department. (Same as Spanish 5670.)

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**

3310 Italian Language in English Translation (3-4) Sicilian School. Dante, Petrarch, Boccaccio, Machiavelli, Ariosto, Tasso. 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

3510-20 Aspects of Italian Literature (4, 4) 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, Goldoni. 4020—Twentieth-century theatre; operatic drama, the Grottesco, Pirandello, De Filippo, Frati. 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

4050-60-70 Dante and Medieval Culture (3, 3, 3) Readings and lectures in English for students majoring in or minoring in other departments. Readings, reports, and term papers in Italian for students majoring in or minoring in Italian. (Same as Comparative Literature 4050-60-70.) 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 Pulp 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 96. E
5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E

Portuguese
3510-20 Aspects of Portuguese Literature (4, 4) Prereq: Intermediate Portuguese or equivalent. Recommended for literature majors. F, W
4310-20-30 Directed Readings in Brazilian and Portuguese Literature (3, 3, 3) May be repeated with consent of department. A
5101 Foreign Study (1-12) See page 96. E
5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E

Spanish
4030 Masterpieces of Spanish Literature In English Translation (3) No foreign language credit. A
4050-50-70 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
4140 Theatrical Spanish (1-3) Performance in one or more Spanish plays. Prereq: Intermediate Spanish or equivalent and consent of instructor. May be repeated with consent of department. Maximum 6 hrs.
4150-70 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. 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 4280.) W
4270 Introduction to Romance Linguistics (3) (Same as French and Linguistics 4270.) Sp
4410 Spanish Civilization (3) Prereq: Intermediate Spanish or equivalent. F
4420-30 Latin American Civilization (3, 3) Prereq: Intermediate Spanish or equivalent. W; Sp
4456 Studies in Modern Spanish Style (3) Prereq: 3410-20-30 or consent of instructor. A
4510 Special Topics in Twentieth Century Spanish Literature (3) Prose, poetry and theatre of Spain in the twentieth century. Genre, movement, or combination of 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-Literary poetry. Prereq: Intermediate Spanish or equivalent.
4810-20-30 Topical Survey of Spanish American Literature (3, 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) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during quarter when such a student uses university facilities. Scholarly work before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5101 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
5070-50-70 Hispano-Arabic Literature and Culture (3, 3, 3) May be repeated with consent of department. A
5101 Foreign Study (1-12) See page 96. E
5102 Off-campus Study (1-12) See page 96. E
5103 Independent Study (1-12) See page 96. E
5110-20-30 Old Spanish (3, 3, 3) Medieval Spanish 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.
5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as French and Italian 5151-61-71.) S/NC only. A
5211-21 Don Quixote (3, 3) Must be taken in sequence.
5212-32 Golden Age Prose (3, 3) 5212-La Celestina: critical study of Fernando de Rojas' life and work. Celestinesque genre; Feliciano de Silva's Segunda Celestina, 5232—Guzman de Alfarache and Spanish picaresque genre. A
5250-60 The Generation of '98 (3, 3) Angels Ganivet, Giner de los Rios, Baroja, Unamuno, Valle Inclán, Benavente, Azorín, Pérez de Ayala. A
5270 The Contemporary Novel (3) Civil War and post-Civil War period. A
5310-30 Directed Readings (3, 3) E
5311-21 Special Topics in Spanish or Spanish American Literature (3, 3) May be repeated. A
5340 Problems in Hispanic Culture (3) Prevailing 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
5550-60 The Golden Age Theatre (3, 3) 5550—Introduction to Spanish Theatre. Lope and Tirso. 5560-Castro, Alarcon, Moreto and Calderon. A
5510 Spanish American Prose to 1900 (3) Novel, chronicle, essay. A
5611-21 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 Darío, Quiroga, Borges, Areola, and Ruflo A
5633 Twentieth-century Latin American Theatre and Film (3) Readings from works of Carlos, Soror, Zanolo, Rodolfo Usigli, Conrado Nale Roxlo, Roberto Coss, Rene Marques and Sebastián Salazar Bondy. Presentation of films as adaptations of classics such as Doña Bárbara, Los de abajo and Don Segundo Sombra as well as exponents of experimental cinema of today. A
5640 Latin American Women Writers (3) Feminine point of view, modern image of woman, female relationships and society as context for woman's destiny. Readings from poetry and fiction, including such authors as Alfonsina Storni, Delmira Agustini, Gabriela Mistral, Silvia Bulrich, 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 stories. A
5670 Problems in Linguistics: Romance Languages (3) (Same as French 5670.) A
5810-20-30 Spanish Lyric Poetry (3, 3) A
5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as French 5910.) A
6000 Doctoral Research and Dissertation (3-15) P/NP only. 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., Ph.D.

Professors:
D. R. Flочек (Head), Ph.D. North Carolina; J. A. Black, Ph.D. Iowa; J. D. Champion, Ph.D. Purdue; L. Ebersole, Ph.D. Pennsylvania; D. Hastings, Ph.D. Massachusetts; N. Shover, Ph.D. Illinois; S. Wallace, Ph.D. Minnesota.

Associate Professors:

Assistant Professors:

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 Departmental Graduate Manual.
THE DOCTORAL PROGRAM

General requirements for the degree of Doctor of Philosophy in Sociology include:

1. A minimum of 108 credit hours following the Bachelor's degree, exclusive of credit 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. Exclusive of doctoral research and dissertation at least one-half of all credits shall be in courses numbered 5000 or 6000.

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. At the 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 structure and functions of law and legal process. Particular emphasis is placed on problems of law and social change, and on structure and functioning of legal sanctions. Some attention is paid to law and law-like phenomena in formal organizations and primitive societies.

4110 Population Problems (4) Demographic factors and social structure; trends in fertility, mortality, population growth, migration, distribution, and composition; population policy.

4120 Topics in Social Psychology (4) (Same as Psychology 4120.)

4130 Sociology of Punishment and Corrections (4) Traces development of correctional movement, develops a critical sociological perspective on contemporary correctional programs, and provides overview of evaluative research in corrections.

4150 Theory of Attitudes and Values (4) Organization of research on attitudes and values; approaches to attitude change; and relationship to attitudes, values and behavior.

4310 Criminology (4)

4330 Urban Ecology (4) Examination of public, private, collective, and individual space. Classical school of ecology, its neoclassical revisers, social area analysis, and cognitive symbolic ecology emphasized.

4410 Educational Sociology (3) (Same as Curriculum and Instruction 4410.)

4530 Community Organization (4) Structure; functions and measurement of attitudes and values; approaches to attitude change; and relationship to attitudes, values and behavior.

4530 Community Organization (4) Structure; functions and measurement of attitudes and values; approaches to attitude change; and relationship to attitudes, values and behavior.

4540 Social and Religious Change (4) Critical review of historical and contemporary theories and methods employed in study of social change. Attention given to both macro and micro group change. (Satisfies a Religious Studies requirement.)

4560 Formal Organization (4) Analysis of bureaucratization process, division of labor, delegation of authority, channeled communication under a system of rational-legal jurisdiction. Analysis of intergroup relations with attention given to both past and present relationships of selected groups to broader society.

4930 Social Movements (4) Development, organization, and function of social movements; attention is given to the ideology, leadership and organization of political, religious and other types of social movements.

4940 Sociology of Religion (4) Interrelationship of society, culture, and religion. (Same as Religious Studies 4840.)

5000 Thesis (1-15) P/NP only. 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

5610 Professional Seminar (1) Limited to sociology graduate teaching assistants to graduate assistants. May be repeated. Maximum 4 hrs. S/NC only. W, Sp

5210 Social Theory (3) F

5230 Seminar in Sociology of Medicine (3) May be repeated with consent of instructors. Maximum 9 hrs.

5300 Methods of Sociological Research I (3) Assumptions and foundations of sociological research strategies and techniques.

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

5350-50 Statistical Analysis in the Social Sciences I, II (3, 3) Topics include multiple regression, analysis of variance, analysis of covariance, ordinal and nominal measures of association, sampling, significance tests, and confidence limits. Extensive use of social science computing packages.

5470 Foundations of Social Psychology (3) Current and classical theoretical perspective in social psychology. May be used for credit in psychology.

5480 Foundations of Social Conflict and Change (3)

5510 Delinquency and the Social Structure (3) Critical assessment of contemporary theories of delinquency, research findings related to them, and their implications for formal strategies of control and rehabilitation.

5520 Crime, Law, and Social Control (3)

5650 Demographic Techniques (3) Life, table, standard rates, and survey techniques of population analysis.

5660 Seminar in Community (3)

5680 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.

5710 Seminar in Collective Behavior and Social Movements (3)

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.

5740 Seminar in Social Attitudes (3)

5810 Seminar in Race and Culture (3) Critical examination of theoretical and conceptual approaches in study of intergroup relations.

5830 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.

5840 Seminar in Occupations (3) Occupations and their relation to inequalities in society; technology and occupations; unequal rewards and occupations; social organization and occupations.

5850 Seminar in Occupations (3) Continuation of material in Sociology 5840; interface between occupations and settings in which they are performed.

5870 Social Organization (3) Structure and function of human groups, with special attention to voluntary associations and administrative organizations.

5880 Seminar in Research Problems in Inter-group Relations (3) Research techniques and problems as encountered in race and intergroup relations are explored; actual field research projects are performed.

5890 Sociology of Development and Modernization (3) Comparative approach to institutional and organizational correlates of modernization. Relations between urbanization, industrialization, and modernization.

6000 Doctoral Research and Dissertation (3-15) P/NP only. E

6050 Seminar on Methods of Social Research (3) Experimental research projects. (Same as Psychology 6050.)

6220 Advanced Social Theory I (3) Prereq: 5410 or consent of instructor.

6230 Advanced Social Theory II (3) Prereq: 5410 or consent of instructor.

6330-40 Survey Design and Analysis (3, 3) Application of general methodological principles to particular operating context of survey. Systematic exploration of survey problems through student participation in design and analysis of survey (2 qtrs). Prereq: 5300-10 or consent of instructor.

6350 Field Research (3) Prereq: 5300-10 or consent of instructor.

6360 Field Research Practicum (3)

6410 Tutorials in Advanced Topics (3) Individual instruction. Prereq: Consent of department. 6410 and 6420 may be repeated in any combination for a maximum of 18 hrs.

6420 Special Topics (3) Topic of special interest or student elected course which will not be regularly offered. Prereq: Consent of instructor. 6410 and 6420 may be repeated in any combination for a maximum of 18 hrs.

6520 Sociology of Deviance (3) Advanced studies in deviant behavior. Theories and findings regarding causes and procedures and programs for social control. Prereq: 4310 and 5520.

6530 Sociology of Law (3) Analysis of social and cultural factors influencing emergence and maintenance of law as social institution and affecting relations between law and deviant behavior; appraisal of theoretical and methodological issues encountered in studying law.

6540 Seminar in Environmental Sociology (3)

6560 Urban and Regional Sociology (3) Prereq: Consent of instructor.

6660 Human Fertility (3) Historical, topical, regional, and methodological approaches to human fertility and demographic problems. Consideration of relations obtained between socioeconomic and demographic change in various parts of world; fertility rates and national power; controversy on control of vital rates of growth. Prereq: 5650 or consent of instructor.

6670 Theory and Methods of Human Ecology (3) Theoretical perspective and research techniques of
human ecology applied to selected research sites. Prereq: Consent of instructor.

6880 Theory and Research in Human Migration (3) Prereq: 5560 or consent of instructor.

6890 Population Theory (3) Malhotra, Marx, optimum population, and selected variables. Prereq: 5560 or consent of instructor. A

6730 Advanced Studies in Social Psychology (3) Social interaction and personality; genetics and functioning of self; interplay of social structures and individual actions; theories of social psychology related to these problems and recent research are discussed. May be repeated. Prereq: 5470 or consent of instructor.

6740 Formal Organization (3) Major formal organizational theories; bureaucracy; functions of theoretical models of organizations; major organizational variables; organizational authority patterns; communication in formal organizations. Prereq: 5470 or consent of instructor.

6750 Formal Organization (3) Organizations, organizational change and effect of technology; social consequences of automation; unionization and organization; communities and organization respectively. Prereq: 5470 or consent of instructor.

6780 Mass Behavior (3) Prereq: 5470 or consent of instructor.

6790 Socialization (3) Process to learn cognitive systems and forms of behavior of social world. Examination of main currents in socialization theory and research. Prereq: 5470 or consent of instructor. May be repeated with different instructors. Maximum 6 hrs.

6820 Political Sociology (3) Political system from societal, organizational, and group perspectives.

6830 Seminar in Class and Status (3) Classic and recent studies of class and status. Methods used in research and current position of theory. Prereq: 5480 or consent of instructor.

6840-50 Social Change (3, 3) Major theories, methods and research.

6860 Seminar on Community Power (3) Analysis of the theory and methods used in studying social power in communities. Prereq: 5480 or consent of instructor.

Spanish

See Romance Languages

Speech and Hearing Sciences

See Audiology and Speech Pathology

Speech and Theatre

MAJOR

Speech and Theatre

Theatre

DEGREES

M.A.

M.F.A.

Professors:

R. S. Ambrister, Ph.D. Ohio State; B. V. Daniels, Ph.D. Cornell; L. J. DeCuir, M.F.A. Tulane; M. E. Hampton, Ph.D. International College (Los Angeles).

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.

MASTER 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 30 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

(1) Enrollment in Speech 4999 during each quarter of full-time graduate study.

(2) 12 hours in rhetorical and communication theory.

(3) 9 hours in public and interpersonal communication.

(4) 3 hours (not inclusive of Speech and Theatre 5110 and Speech 4999) in methods and materials in speech communication.

Theatre

(1) 15 hours in theatrical history and criticism.

(2) At least 9 hours (and no more than 12 hours) in performance and production courses may be included in the 45-hour minimum for the degree.

(3) No more than 6 hours in projects, courses.

MASTER OF FINE ARTS DEGREE CURRICULUM

At least 60 quarter hours, 40 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 work 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 already have 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 campaign for women's rights from the 1830s to present. Prereq: 4751.

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 interpersonal, intrapersonal, and mass communications systems. F

5210 Topics in Group and Interpersonal Communication (3) May be repeated. Maximum 9 hrs. Sp

5320 Quantitative Projects in Speech Communications (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 extra-curricular forensic 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

4640 Group Performances of Literature (4) Oral interpretive techniques in reading, leading, chanting, and chamber theatre. F, W

5000 Thesis (1-15) F/P/NP only. 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 the extra curricular facilities of the theatre department. Must be taken in sequence. Maximum 9 hrs. E

5110 Introduction to Graduate Research in Speech and Theatre (3) F

5120 Directed Reading and Research (3) May be repeated. Maximum 9 hrs. E


Theatre

3214-15 Technical Theatre (4, 4) Special techniques in scenery design and construction; costume design and construction; properties, lighting and sound. Prereq: 2211-21, 2221-22 and consent of instructor. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3221-22 Introduction to Scene Design (4, 4) Design of scenic elements as part of the overall setting for a play, with particular emphasis on the design of settings as environments for dramatic action. Prereq: 2211-21, 2221-22 and consent of instructor. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3252-53-54 History of the Theatre (4, 4, 4) Drama in performance with particular emphasis on theatre architecture, scene design, and acting styles. Prereq: 3252-53. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3262-63 History of American Theatre (3, 3) Development of theatre as social institution in American life. Prereq: 2211-21 or consent of instructor. Graduate credit available to Theatre MFA students only.

3281-82-83 Design and Technical Theatre Seminar (3, 3, 3) Problems of model-making. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

3291-92-93 Problems in Stage Design with Reference to Development of Theatre as Social Institution in American Life (3, 3, 3) Emphasis on the social and environmental opportunities and constraints; role of the theatre in the social and political life of the community. Graduate credit available to Theatre MFA students only.

3352-34-35 Production Seminar in Acting (1-3, 1-3, 1-3) Available to Theatre MFA students only.

3451-52 Advanced Theatre Costume Design (4, 4) Design of costume for various theatrical and dramatic productions. Prereq: 3511 or 3512. W

4751-52 Dramatic Theory and Criticism (3, 3) W

4951-52 Playwriting (4, 4) Prereq: Consent of Instructor. F/W

5011-12-13 Projects in Lieu of Thesis (3, 3, 3) Available to Theatre MFA students only. Graduate credit available to Theatre MFA students only.

5250 Seminar in Playwriting (3) Sp

5310 Studies in European Theatre History (3) May be repeated. Maximum 9 hrs. F, W

5320 Studies in American Theatre History (3) May be repeated. Maximum 9 hrs. F, W

5620 Projects in Lighting Design (3) May be repeated. Maximum 9 hrs. E

5630 Projects in Play Directing (3) May be repeated. Maximum 9 hrs. E

5640 Projects in Scene Design (3) May be repeated. Maximum 9 hrs. E

5650 Projects in Costume Design (3) Problems of play interpretation and theatrical costume design; design of costumes for various theatrical and dramatic productions. Prereq: 3451-52. Must be taken in sequence. Graduate credit available to Theatre MFA students only.

5660 Projects in Technical Theatre (3) Problems of set design, interpretation, and execution. E

5670-71-72-73-74-75 Master Class In Acting (5, 5, 5, 5, 5, 5) Available to Theatre MFA students only.

5680-81-82 Design and Technical Theatre Seminar (1-5, 1-5, 1-5) Available to Theatre MFA students only. May be repeated. Maximum 6 hrs.

5800 Studies in Theatrical Production (3) May be repeated. Maximum 9 hrs. Sp


5940-41-42 Advanced Audiology (3, 3, 3) F, W

Speech Pathology

Speech Pathology

See Audiology and Speech Pathology.

University Studies

(Non-Departmental)

University Studies deal with important contemporary topics which are sufficiently comprehensive to require the study and attention of students and faculty from more than one college. They are open to all qualified members of the university community.

4100 Energy Needs and Our Environment (3) Problems of present and projected energy resources and demands; economic, behavioral, legal, technical and environmental opportunities and constraints; regional impacts of energy production and consumption. Topical focus will change from quarter to quarter. May be repeated with consent of instructor. Must not be taken for graduate credit by Ecology majors.

4441-42 Advanced Play Directing (4, 4) Problems of play interpretation; directing period plays; preparation of a play for public performance. Prereq: 3451-52 and consent of instructor. Must be taken in sequence. F, W

4541-42 Advanced Theatre Costume Design (4, 4) Advanced problems in costume design and construction. Must be taken in sequence. F, W

5451-52 Advanced Theatre Costume Design (4, 4) Advanced problems in costume design and construction. Must be taken in sequence. F, W

5461-62-63 Design and Technical Theatre Seminar (3, 3, 3) F

5680-81-82 Design and Technical Theatre Seminar (3, 3, 3) F

Zoology

MAJOR

DEGREES

M.S., Ph.D.

Programs:

J. H. Aber (Head), Ph.D. Brown; R. M. Bagby, Ph.D. Illinois; D. L. Bunting, Ph.D. Florida; W. C. Darby, Ph.D. Illinois; D. L. Etter, Ph.D. Minnesota; R. C. Fraser, Ph.D. Minnesota; B. Hochman, Ph.D. California (Berkeley); J. C. Howell (Emeritus), Ph.D. Cornell; E. T. Howry, Ph.D. Wisconsin; K. W. Keen, Ph.D. London (England); A. W. Jones (Emeritus), Ph.D. Indiana; R. A. Kenned3, Ph.D. Iowa; J. N. Little, Ph.D. Ohio State; L. E. Roth, Ph.D. Chicago; C. A. Shields, Ph.D. Michigan State; J. T. Tanner (Emeritus), Ph.D. Cornell; S. R. Tipton (Emeritus), Ph.D. Duke; H. G. Welch, Ph.D. Florida; G. L. Whitson, Ph.D. Iowa

Associate Professors:

K. D. Buxham, Ph.D. Iowa; A. C. Echternacht, Ph.D. Kansas; A. A. El-Banna, Ph.D. Washington State; D. J. Fox, Ph.D. Johns Hopkins; M. A. Handel, Ph.D. Kansas State; J. A. MacCabe, Ph.D. California (Davis); M. L. Pan, Ph.D. Pennsylvania; S. L. Pimm, Ph.D. New Mexico State; S. E. Rechert, Ph.D. Wisconsin; G. A. Vaughan, Ph.D. Duke; M. C. Whiteside, Ph.D. Indiana

Assistant Professors:

T. T. Chea, Ph.D. Andria; L. D. Etkin, Ph.D. Indiana; N. Greenberg, Ph.D. Rutgers; G. F. McCracken, Ph.D. Cornell

College of Liberal Arts/Zoology 139
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 will be an 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 sizeable amount of literature 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 the third quarter of a language course. 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.

3060 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 (3) Introduction to insects: basic structure, development, behavior; classification of insect orders and representative families; interpretation and use of keys. Prereq: 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. Prereq: Biology 3130. 3 hrs and 2 labs. W

3220 Physiology of Reproduction (3) (Same as Animal Science 5220) F, Sp

3320 Histology (4) Study of animal tissues. Prereq: Biology 3120. 2 hrs and 2 labs. F, Sp

3410 Bioethics (3) Relationship between biological discoveries and human values. Open discussion of selected dilemmas arising from new knowledge about medicine, behavior, resources, and technology. Sp

4007-4017 Minicourse in Zoology (2 hrs each) Selected, advanced topics in zoology, concentrated in time and subject matter. Consult departmental listing for actual topics offered. Prereq: As posted. May be repeated. E

4050 Developmental Biology (4) Experimental morphogenesis, fertilization, cellular interactions, hormonal effects and related topics with examples drawn primarily from invertebrates and vertebrates. Prereq: 3060-3061. Coreq: 3320. 4 hrs and 1 lab. F

4120 Undergraduate Research Participation (2) Experience in active research projects under supervision of staff members. Prereq: Consent of instructor. E

4140 Practicum in Zoology (1-3) Participation in practical application of zoology in community institutions, government organizations and industry. Approximately 5 hrs involvement per week. Prereq: Biology 3110, 3120, 3130 and senior standing. E

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. Prereq: 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 information and control which examines kinetics and integration of the cell. Prereq: Cell biology, or any physiology, and organic chemistry. Recommended prereq: Biochemistry. 3 hrs and 1 lab. Sp

4240 Animal Ecology (4) Environmental factors determining distribution and numbers of animals. Intraspecific relations; problems and methods. Prereq: Biology 3130. 2 hrs and 2 labs. F

4250 Comparative Animal Physiology I (3) Environmental physiology. Survey of physiological mechanisms and their relation to animal ability to survive in diverse physical environments. Prereq: Biology 3120-30 and 2 yrs chemistry. W

4259 Comparative Animal Physiology Laboratory I (1) Coreq: 4250. W

4260 Comparative Animal Physiology II (3) Senory, effector and integrative physiology. Prereq: 3060 Sp

4259 Comparative Animal Physiology Laboratory II (1) Prereq: 3060 and consent of instructor. Coreq: 4250. Sp

4270 Immunology (3) (Same as Microbiology 4707). F

4280 Comparative Endocrinology (5) Comparative analysis of the physiology and morphology of endocrine glands in vertebrates and invertebrates. Their role and interaction in maintenance of the organism and species. Prereq: 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) Prereq: 3320 recommended. 2 hrs and 2 labs. F

4330 General Cytology (4) Study of cellular organelles at the light and electron microscope levels and the functioning of these organelles. Prereq: Biology 3120. Sp

4369 General Genetic Laboratory (2) Mainly Dro sophila experiments designed to illustrate basic principles of inheritance. Prereq: Biology 3110. W

4380 Organic Evolution (3) Modern concepts of animal evolution. Prereq: Biology 3110. F

4390 Human Genetics (3) Principles and problems of inheritance in humans. Prereq: Biology 3110. F

4410 General Parasitology (4) Morphology, taxonomy and ecology of parasitic worms and protozoa, with emphasis on host-parasite relationships. Prereq: Biology 3130 or consent of instructor. 3 hrs and 1 lab. F

4460 Introduction to Aquatic Ecology (4) Physicochemical nature of inland waters. Biotic communities are described, interrelationships explored. Prereq: Chemistry 1110-20-30, Biology 3130. 2 hrs and 2 labs. F

4700 Arachnology (4) Biology of spiders, mites, and other Arachnida. Prereq: Biology 3130 or consent of instructor. 3 hrs and 2 labs. Sp

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720). F

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Psychology 4729). F

4810-4820 Taxonomy of major orders of fish. Prereq for 4810-20: 3110 or consent of instructor. 2 hrs and 2 labs. W

4840 Physiology of Exercise (4) Functions of body in muscular work; physiological aspects of fatigue, training, and physical fitness. Prereq: 2920-30 or 3080. 3 hrs and 1 lab. F, Sp

5000 Thesis (1-15) P/N/P only. E

5017 Colloquium in Ethology (1) (Same as Psychology 5017). S/NC only.

5050 Zoology Seminar (1) Advanced topics or controversial topics in zoology. May be repeated. Maximum 6 hrs. All senior Zoology majors encouraged. Required of all first- and second-year graduate students. S/NC only. F, Sp

5075 Zooplankton Ecology (4) Secondary productivity in aquatic systems. Prereq: 4660 or equivalent. Su

5080 Graduate Research Participation (3) Advisory. Prereqs studied under supervision of staff research director whose research area coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of department and research director. May be repeated with consent of department. S/NC only. E

510-20-30 Special Problems (2, 2, 2) E

5150 Zoological Bibliography (1) Methods of locating and using zoological literature, bibliographies, and abstracts, and of preparing bibliographies and scientific papers.

5180 Fresh Water Invertebrate Zoology (4) Ecology and taxonomy of fresh water invertebrates exclusive of insects. Laboratory and field study. Prereq: 3150. W

5210 Plant Parasitic Nematodes (4) (Same as Entomology and Plant Pathology 5210). W


5270 Advanced Neuroanatomical Physiology (5) Cellular and molecular aspects of phenomena associated with conduction of excitation and muscular contraction. Prereq: 4250. 3 hrs and 2 labs.

5280 Insect Physiology (4) Functions and interrelations of systems with emphasis on metabolism, coordination, movement, and reproduction. Prereq: 4810. 1 hr general chemistry or consent of instructor. 2 hrs and 2 labs. W

5290 Quaternary Problems (4) (Same as Geology 5290 and Botany 5290). F

5310-20 Seminar in the Teaching of College Zoology (2, 2) Current and principles in teaching of zoology: modern techniques and instrumentation; supervised application of teaching principles and methods. Must be taken in sequence. Prereq: Consent of instructor. S/NC only.

5350 Biometry (3) Statistical methods used in analysis of quantitative biological data. Prereq: 1 qt of statistics or consent of instructor. F

5365 Isotopic Methods and Techniques: Lecture (2) Theory of isotopic decay, measurement of isotopic decay by liquid scintillation counting, single and double isotope counting, counter, optimization of counting parameters for single and double isotope counting, quenching and correction, measurement of Cerenkov radiation, radiomimnassay, synthesis of metabolic intermediates, experimental design and data analysis. Coreq: 5389. Prereq: Upper division laboratory course in either physiology, biochemistry, microbiology, or consent of instructor. F

5370 Isotopic Methods and Techniques: Laboratory (4) Use of liquid scintillation counter, optimization 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, radiomimnassay of steroid hormones, hormone synthesis, synthesis of metabolic intermediates.
other topics. Coreq: 5360. 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.

5430 Advanced Medical Entomology (3) Prereq: 4430.

5510-20 Animal Physiology (5, 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 4190 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.

5620 Methods of Experimentation with Laboratory Mammals (3) Design to give competence in handling research mammals. Techniques of anesthesia, drug administration, radiography and surgery. Prereq: 4050, or 4410, or consent of instructor.

5640 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. W

5750 Physiological Ethology (3) Behavioral endocrinology and neurology from ethological perspective; reciprocal relationships of physiology and behavior in natural context. Prereq: Consent of instructor, or Psychology/Zoology 4720, or undergraduate course in physiology. W

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: 5615. (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) P/NP only. E

6110 Advanced Topics In Cell and Molecular Biology (1-3) Readings and discussions of recent advances in cell biology. Prereq: Biology 3120 and consent of instructor. May be repeated with consent of department. Maximum 12 hrs.

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) May be repeated. Maximum 6 hrs.

6350 Seminar in Developmental Biology (2) Internal 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, 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 (2) Prereq: 5610. Coreq: 5620. May be repeated. Maximum 6 hrs. (Same as Radiation Biology 6910.)
Robert L. Summitt, Dean
Joseph C. Parker, Jr., Associate Dean, Knoxville

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 campus 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: W. R. Farkas (Acting Chairman), Ph.D. Duke; J. E. Fuhr (Director), Ph.D. St. John's; C. C. Congdon, M.D. Michigan; J. B. Jones, D.V.M. Illinois; R. D. Lange, M.D. Washington (St. Louis); C. B. Lozzi, M.D. Buenos Aires (Argentina); T. P. McDonald, Ph.D. Tennessee; E. A. Machado, M.D. Buenos Aires (Argentina); P. W. Wigler, Ph.D. California (Berkeley).


Assistant Professors: W. T. Hanna, M.D. Ain-Shams (Egypt); K. 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 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.

4310 Introduction to Hematology (4) Pathophysiology of blood and blood forming systems. Lectures, class discussions and demonstrations. Prereq: Upper division biology background to include histology and/or general anatomy.

4430 Clinical Genetics (3) Human genetic disorders, case presentations. Prereq: General biology and general genetics background or consent of instructor.

5000 Thesis (1-15) P/NP only. E


5420 Special Topics in Metabolic Disease (1-3) Biochemical and physiological basis of selected diseases of humans and animals. Clinical-pathological correlations. Prereq: Biochemistry 4110-20 or equivalent.

5429 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) P/NP only. E

6110 Advanced Topics in Medical Biology (2) 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.

6520 Special Topics in Pathology (1-3) Pathologic anatomy, biochemical pathology, and related areas. Primarily for doctoral candidates in Comparative and Experimental Medicine. Prereq: Consent of instructor. May be repeated. Maximum 8 hrs.
The Bachelor's degree is not in Nursing, the GENERAL REQUIREMENTS for referral to nurse researchers.

By generating research topics through data collection, tabulation, and analysis, any 5. Participate in clinical research activities by means of data collection, tabulation, and analysis, and by generating research topics for referral to nurse researchers.

GENERAL REQUIREMENTS FOR ADMISSION

1. Meet requirements for admission to the Graduate School.
2. Hold a Bachelor's degree in Nursing. If the Bachelor's degree is not in Nursing, the applicant must successfully complete the equivalent of an upper division major in Nursing as part of the M.S.N. program.
3. If the number of qualified applicants exceeds the number that can be accommodated, preference will be given to applicants:
   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 course work with a cumulative GPA of 3.0 or better.
2. The 60 credit hours must include the following components:
   a. Core requirement: 23 hrs
   b. Clinical concentration option: 20 hrs
   c. Functional concentration option: 11 hrs
   d. Role preparation option: 11 hrs
   e. Electives: 6 hrs

3. A Master's thesis is not required, but those students who wish to complete a thesis as a 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 5120-53 and 5310. Students selecting the community health nursing option must complete 5410, 5460, 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 or advanced clinical practice. Students selecting the teaching option must complete 6 hours of graduate level courses in education and 5630. Students selecting the advanced clinical practice functional 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.
8. Students whose baccalaureate degrees are not in nursing must complete the equivalent of a baccalaureate nursing major by taking or challenging a series of undergraduate nursing courses as determined by each student's major 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.
2. Any hours so applied would be from courses in the first degree program that are directly relevant to the second. Hours from the first program to be applied to the second shall have been earned within the time limits (six years) established for the second.
3. Reduction of hour requirements, when appropriate, will not be used to reduce the residency requirements of the second Master's degree.
4. The 45 to 60 hours must include the following components:
Roy F. Knight, Dean
William J. Lauder, Associate Dean

Professors:

Associate Professors:
A. G. Anderson, M.A. Missouri; M. C. Martin

Assistant Professors:
R. R. Kelso, M.S. Tennessee; W. E. Martelle, B.Arch. California (Berkeley); M. S. Moffett, Ph.D. Massachusetts Institute of Technology; V. Naranck, J. Arch. Belgrade; R. T. Quinn, Ph.D. Lehigh.

Lecturers:
A. G. Anderson, M.A. Missouri; M. C. Martin

4430 Architecture and Preservation (6) Rehabilitation, restoration, and adaptive uses of existing buildings.


4811 Special Topics in History, Theory and Criticism (1-4) Special topics in history-related subjects. May be repeated. Maximum credit 6 hours.

4815 Criticism Seminar (3) Theories, function, and techniques of architectural criticism.

4830 Introduction to Preservation (3) History and theory of architectural preservation and restoration.

4831 Preservation Technology (3) Techniques of preservation, dating, methods of analysis, history of materials and technology used in old buildings.


4833 Preservation Law (3) Legal aspects of contemporary preservation activity.

4850 Elementary Structural Matrix Methods (4) Introduction to generalized matrix methods of analysis of structures. Review of matrix algebra and vectors; development of member stiffness and flexibility matrices; assembly of structure stiffness and flexibility matrices. Prereq: Consent of instructor. (Same as Civil Engineering 4850 and Engineering Science and Mechanics 4850.) Su

4870 Architectural Photography (3) Photography as a design, research, and presentation medium. Emphasis on architectural photography using black and white media, E

4871 Advanced Architectural Photography (3) Application of special photographic techniques with emphasis on color printing and processing. Prereq: Consent of Instructor. F, W, Sp

4887 Structural Design for Protection Against Extreme Hazards (3) Probability, risk, human values, insurance. Survey of building codes and structural design of steel, masonry, concrete, and wood structures to resist extreme effects. Protective design for human and system needs. Fire protection engineering, fire phenomena, life safety and analysis, high-rise building fires.


4940 Proxemics (4) Seminar for graduate students and upper division students. Introduction to proxemic research. Definition of proxemic variables. Proxemic notation exercises. Analysis of etic data and the identification of emic categories. Observer bias and methods of bias reduction. Members of seminar required to design, conduct, and present original proxemic research. Prereq: 2000 or consent of instructor.

4950 Environment as Code (4) Advanced lecture of graduate students and upper division students. Advanced lecture course of theoretical issues involved in considering environment as a medium of human communication. Codes and nature of coding behavior in animals and humans. Relationship between coding behavior and the organization of the central nervous system. Coding and social behavior. Communication process as a generic model of human environment relations. Hierarchical aspects of environmental communications. Prereq: 2000 or consent of instructor.
Graduate School of Biomedical Sciences

W. E. Barnett, Director

MAJOR DEGREES
Biomedical Sciences 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 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 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 experience of that staff, as well as the most advanced research methods and technology.

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) strength in the basic sciences; (2) perception of the biomedical sciences as a whole; and (3) experience and training in a chosen specialty.

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

ADMISSION REQUIREMENTS
A Bachelor's degree or its equivalent is required. Students with M.S., D.V.M., or M.D. degrees are also encouraged to apply. Completed applications, Graduate Record Examination scores and letters of reference should be sent to the address below. The student will need previous training in biology, calculus, physics, and organic and physical chemistry. However, a course in physical chemistry is offered by the School in order to meet this requirement. It is recommended that deficiencies in meeting entrance requirements be eliminated prior to entrance.

Requests for application forms, information on admission, financial support, and housing should be sent to:
Director, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, Biology Division, ORNL, Box Y, Oak Ridge, Tennessee 37830.

THE DOCTORAL PROGRAM
Requirements for the Ph.D. degree are:
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 (5180-90); Mammalian Physiology (5200); 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.
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 5000).
3. 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: E. Allen, Ph.D. Tennessee; D. E. Ollins, Ph.D. Rockefeller.

Assistant Professor: M. D. Mamrack, Ph.D. Baylor.

Research Associate Professors: C. H. Hanson, Ph.D. Washington; A. L. Ollins, Ph.D. New York.

Research Assistant Professor: E. A. Hiss, Ph.D. Notre Dame.

Shared Faculty

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) P/NP only; E

5070-80 Physical Chemistry (3, 3) Thermodynamics, equilibrium; chemical equilibria; electromagnetic force, surface chemistry, electrolyte solutions, kinetics, conductance, viscosity, diffusion.


5140 Biophysics (3) Energy levels and excited states of large molecules; optical instrumentation; adaptation to system perturbations; properties of macromolecules in solutions; molecular conformations; interactions and intramolecular forces; physical principles of microscopy. Coreq: 5140.

5150 General Genetics (3) Mendelian genetics, mitosis, meiosis, and cell death. Transmission genetics, mapping, and linkage.


5170 Molecular Genetics (3) Molecular biology of genetic processes. Gene regulation; coding; protein synthesis; suppression of nonsense and nonsense mutations; mutagen mechanisms; complementation; recombination. Prereq: 5110-20, 5160.

5180 Cell Biology I (3) Structure and composition of major nuclear and cytoplasmic organelles of eukaryotic cells. Pertinent instruments and techniques; meiosis and mitosis; cell cycle; chromosome structure; nuclear RNA metabolism; nucleoli and ribosomes. Coreq: 5110-20.

5190 Cell Biology II (3) Comparative biochemical approaches to cell structure and function. Membrane systems and metabolism; development and function of mitochondria, chloroplasts, peroxisomes and other organelles, to metabolism and replication; transport phenomena; cell cycle. Coreq: 5110, 5180. Coreq: 5120.

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 Biochemical Concepts in Medical Sciences (3) Biochemical mechanisms involved in physiological conditions and pathological processes of human body. Dynamic functions of organ systems; biochemical pharmacology; hormone actions; neurobiochemistry. Current biochemical advances in basic and clinical medicine. Prereq: 5200, 5110-20.

5310-20-30-40 Biomedical Sciences Laboratory (3, 3, 3, 3) To acquaint students with both approaches and technologies in various areas of medical study. Students study a quarter in each of 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 analyses of current journal publications in selected areas of modern medicine. Written evaluation of papers and weekly oral presentations by each student.

5370 Biomedical Sciences Seminar (1) Basic principles of scientific writing. Research articles, grant proposals, review articles, progress reports.

5430-60-90 Graduate Research Participation (3, 3, 3, 3) Tutorials or formal lectures. Potential topics with consent of instructor. May be repeated.

5510-20-30-40 Special Topics in Biomedical Sciences (3, 3, 3, 3, 3) Formal or informal lectures. Potential topics include x-ray diffraction and crystallography; nucleic acids, intermediary metabolism of macromolecules; computer science; pathology; cytochemistry; genetics; mammalian genetics; human genetics; cancer research; plant physiology; radiation biology; aging research. Additional courses developed 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 variations; normal, binomial, 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 bond processes, collision and reaction, molecular rearrangements, oxidation-reduction, solvolysis, protein and nucleic acid modifications, reactions involving proteins and nucleic acids on polymer supports.

5860 Cryobiology (3) Physical and chemical responses of cells and bacteriophage to low temperatures and ice formation. Relation of these responses to permeability, structure of semipermeable membranes, metabolism of macromolecules, and nature and state of water in cells; and how they bear on other fields of biology and medicine—including electron microscopy, photobiology, cell physiology, exobiology of space, 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) P/NP only; E

6200 Nucleic Acid Chemistry (3) Chemistry of nucleotide-derived materials including alkylation, solvolysis, oxidation-reduction, polymerization, synthesis, and isolation. The role of nucleic acids in various metabolic processes. Reaction of nucleic acids in above systems with emphasis on relationship of structure and reactivity. Prereq: 5110-21.

6210 Protein Chemistry and Enzyme Mechanisms (3) Theoretical and practical aspects of protein chemistry including chemical and physical characterizations of proteins, chemical modification of proteins, and structure-function relationships. Latter emphasizes enzymes, includes approximation of structures, catalytic activity, genetic (enzymatic) catalysis, and strain and distillation of substrates. Prereq: 5110-20.


6240 Chemotherapy and Metabolism of Lipids (3) Nomenclature, chromatographic isolation, chemistry, physical properties, and enzymology of lipids. Hormonal action and role of lipids in membranes, enzyme expression, and nervous tissue. Lipid biochemistry of mammal; comparative aspects, particularly lipid pathways in bacteria and yeast. Prereq: 5110-20.

6251 Molecular Biology of RNA (3) RNA synthesis and metabolism in prokaryotes, eukaryotes, and their viruses. Prereq: 5110-20 or consent of instructor.

6252 Molecular Biology of DNA (3) RNA replication, repair, and recombination. Recent advances in mechanisms at molecular level using biochemical and molecular genetics techniques. Prereq: 5110-20 or consent of instructor.

6270 Viral Carcinogenesis (3) History of viral oncology and descriptive catalog of tumor viruses. Biology of normal cells, DNA tumor viruses; replication cycle; transformation; genetics; natural history. RNA tumor viruses; endogenous and exogenous states; genetics; induction; transformation; natural history.

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, kinds 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.
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.

MAJOR 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 enable students to:

1. 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. Understand and use the concepts and procedures related to the selection, acquisition, organization, and dissemination of knowledge;
3. Understand and apply the principles of management to the library and information center;
4. 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 Examination. 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:
M. H. Karrenbrock, M.L. South Carolina; 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 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 (1) Acquisitions, cataloging and maintenance of library collections.

4330 Introduction to Reference Materials (3) Basic information sources and services for all libraries.

4750 Utilization of Instructional Media (3) (Same as Curriculum and Instruction 4750 and Vocational-Technical Education 4750.)
5000 Thesis (1-15) P/NP only. E
5002 Non-Thesis Graduation Completion (3-15) Requires for 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

5110-20-30 Problems in Library Science (3, 3, 3) May be repeated with consent of school.

5140 Research Methods in Library Science (3) Research methods applicable to librarianship. Process and conduct of research; analysis of published research.

5200 Subject Reference and Bibliography (3) General patterns of bibliographical organization and basic information sources in subject fields including non-English materials; experiences in bibliographic methods and search techniques. Prereq: 4330.

5210 Sources and Services for the Social Sciences (3) English and non-English literature and bibliographical sources in education, economics, political science, history, geography, anthropology, sociological and psychological sources in mathematics, physics, astronomy, chemistry, geology, biology and medicine; organization of collections for optimum use. Prereq: 5200.

5220 Sources and Services for the Natural Sciences (3) English and non-English literature and bibliographical sources in mathematics, physics, astronomy, chemistry, geology, biology and medicine; organization of collections for optimum use. Prereq: 5200.

5230 Sources and Services for the Humanities (3) English and non-English literature and bibliographical sources in literature and language, fine arts, music, philosophy and religion; organization of collections for optimum use. Prereq: 5200.

5240 Organization of Library Collections II (3) Construction and maintenance of library catalog as retrieval instrument; indexing and subject analysis theory, comparative classification with emphasis on Library of Congress system, and problems in reclassification. Prereq: 4270.

5250 Government Publications I (3) Acquisition, organization and utilization of U.S. federal government publications; legislative, executive and judicial branches. Prereq: 4330, 5200, or consent of instructor.


5270 Legal Bibliography (3) Introduction to literature of Anglo-American jurisprudence. Use of reports, statutes, administrative regulations and decisions, treatises, periodicals, and indexes as bibliographic tools.

5300 Library Management (3) Management and organization concepts applicable to libraries and librarians.

5310 Multitype Networks (3) Organization, structure, governance, planning, evaluation, and services in state, regional, national, and international networking of information.

5330 Academic Libraries (3) Persistent and current problems. Topics vary depending upon needs and interests of group. Prereq: 4150 or consent of instructor.

5350 School Libraries (3) Persistent and current problems. Topics vary depending upon needs and interests of group. Prereq: 4150 or consent of instructor.

5360 Special Libraries and Information Centers (3) Development and present status, scope and objectives, administration and organizational structures, acquisition, organization, and use of information.

5370 The Library in the Community (3) Public libraries as social agencies: role in education and communication systems of community.

5380 Seminar in Library and Information Science (3) Advanced study of varying topics. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5400 Library Facilities (3) Problems inherent in planning and construction of library quarters. Interrelationships of staff, materials, and user space requirements.


5510 Nonbook Resources (3) Selection, processing, storage and utilization of films, video technology, sound recordings and microforms as information media. Prereq: 5500 or consent of instructor.

5515 Serials (3) Serials collections: selection, acquisition, bibliographic control, processing, storage, maintenance, and public service. Prereq: 5500 or consent of instructor.

5520 History of the Book (3) History of writing and various methods of bookmaking from earliest times through 19th century. Prereq: Consent of Instructor.

5530 Contemporary Publishing (3) Creation, production, marketing, and distribution of materials acquired by libraries, with special attention to various types of publishers.

5540 Archives and Manuscripts (3) Problems involved in acquisition, organization, description, storage, preservation and utilization. Prereq: Consent of instructor.

5550 Records Management for Information Professionals (3) Functional elements and objectives of records management within organizations, emphasizing control of creation, distribution, retention, storage, retrieval, protection, and disposition regardless of medium. Prereq: 4330, 4270, or consent of instructor.

5600 Reading Guidance for Children and Young People (3) Organization to meet needs, interests, abilities of different age and socioeconomic groups. Prereq: 5640 or consent of instructor.

5610 Mass Communications and the Library (3) Mass media of communication in terms of their relation to modern library service, considered as forces that influence what people read, see, and hear.

5620 Traditional Literature and Oral Narration (3) Fundamental principles of art storytelling; techniques of adaptation and presentation for various age groups; instruction and practice in oral techniques.

5630 Critical History of Children's Literature I (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. Fifteenth century to 1800.

5640 Critical History of Children's Literature II (3) Development of literature for children noting influence of changing social and cultural factors; attention to emerging genres through primary sources. 1920 to present.

5691 Advanced Production of Audiovisual Software (3) (Same as Curriculum and Instruction 5691.)

5700 Automation of Library Processes (3) Computer concepts and operations; applications to basic library operations: acquisitions, cataloging, circulation and serials. Coreq: 4270, 5500, or consent of instructor.

5710 Introduction to Information Science (3) Content and method of information science; application of research findings to general library practice.

5720 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: 5700.

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: 5700 or consent of instructor.

5999 Practicum (5 or 9 or 12) Opportunity to translate library theory into practice under guidance of qualified librarians. Prereq: Completion of 21-credit curriculum plus approval of director.
The Graduate School of Planning offers a program of studies leading to the professional degree of Master of Science in Planning (M.S.P.). Students may elect concentrations in land use planning, community development, energy planning, environmental planning, quantitative methods, housing, historic preservation, or transportation planning.

MAJOR

The M.S.P. degree program prepares planners for a diversity of career opportunities in both the public and private sectors. Graduates are candidates for professional positions in regional, city, county, and metropolitan planning agencies; in local, state, and federal agencies concerned with physical, economic and administrative planning; in private business and organizations dealing with development problems; and in private consulting practice.

The degree program typically requires a minimum of six quarters, or 72 credit hours. A core curriculum of 40 hours is required of all candidates. Twenty-three or more additional hours of elective course work and 9 hours for the required thesis or major paper enable the student to pursue special interest areas or topics in the field of urban and regional planning. Elective courses may be selected from courses offered by the School of Planning or by related University departments and programs such as geography, civil engineering, environmental engineering, ecology, real estate and urban development, public administration, and public health. Elective courses are chosen with the advice and approval of the student's faculty advisor.

A work internship is recommended, but not required, during the summer between the first and second year of the program. Students who do not have prior experience in comprehensive plan preparation are advised to enroll in an intensive credit-hour synthesis project course. The required thesis or major paper option provides the student an opportunity to develop and apply research and analytical skills to a particular planning problem or topic.

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, experienced professional planners in TVA and other public and professional organizations frequently teach courses on a visiting basis. Each year a guest lecture series brings to the University and the School outstanding leaders in the fields of planning and development.

The Graduate School of Planning is accredited by the American Planning Association.

ADMISSION PROCEDURES

All applicants should submit two letters of recommendation with their applications. Reference letters should be from teachers familiar with the applicant's undergraduate or, where applicable, graduate academic record. If the applicant has had prior planning experience, a letter from a supervisor or other person familiar with the work of the applicant should also be provided.

Graduate Record Examination scores are not required but, if available, may be provided at the option of the applicant. 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 37996-1700.

FINANCIAL ASSISTANCE

Employment at the Graduate School of Planning Research Center, at local planning agencies, the Tennessee Valley Authority and Oak Ridge National Laboratory may provide an opportunity for selected students to obtain part-time experience while pursuing the degree. Such employment, however, usually extends the period required to complete the degree.

A limited number of graduate assistantships are available through the School. Assistantships carry a waiver of tuition and fees as well as a stipend, and require that recipients work 10 hours per week in School of Planning assignments. Applicants interested in being considered for assistantships and other forms of financial assistance available through the School should submit an application for financial aid to the Director.

DEGREE REQUIREMENTS

Each student will be required to complete a minimum of 72 hours credit of which 46 hours must be in courses offered in planning. The following courses are the required core curriculum for the M.S.P. degree: 5100, 5110, 5130, 5141, 5180, 5230, 5270, 5280, 5340, 5440, 5465. Students who have had previous academic work equivalent to any required core course may petition for a waiver, which can be granted upon demonstration of competence. A proficiency examination will be arranged for students wishing to receive academic credit for previous work.

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 plan the student must have completed at least 48 hours of graduate course work and have attained at least a 3.5 cumulative grade point average (at the time of approval of the major study proposal) in at least 24 hours of planning core curriculum courses. The student meeting these criteria may present a proposal to his/her committee for a major study which will include at least 9 hours of subsequent elective course work related to the study topic. The proposal shall justify the selection of topic, problem or issue and the approach to the study.

Students in the Graduate School of Planning must pass a comprehensive written examination after approximately five quarters of course work.

Faculty

Professors:
D. A. Johnson, Ph.D. Cornell; K. B. Kenney, Ph.D.

Associate Professor: G. E. Bowen, M.A. George Washington.

Assistant Professors: D. Arbit, Ph.D. Cornell; P. Fisher, Ph.D. Florida State; A. Loebi, Ph.D. Missouri.

Courses

4100 Survey of Planning (3) History of city development and of planning with special attention to the U.S. experience in urban and other levels of planning. Problems of building codes, the comprehen-

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student does not use university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S, NC only. E

5005 The Planning Process (3) Identification and examination of generic aspects of planning process and planning techniques applied in 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, graphic presentations, and audiovisual equipment. W

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. E

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 (4) 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 GSP students. F, Su

5130 Planning Research Methods I (3) Research techniques in subject areas associated with city and regional planning. Research tools, data collection and analysis as basis for planning and decision-making. 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. Sp

5141 Statistics for Planners (4) Applications of basic descriptive and inferential classical and non-parametric techniques in planning research. Data organization and display; measures of location, dispersion and association; data transformations; some basic probability theory; selected one and two sample tests; correlation and regression analysis. Prereq: 5130 or consent of instructor. W

5145 Library Research for Planning (1) Survey of publications of interest to planners, including resources and research techniques. Use of facilities and collections of UTK library. F

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.

5170 Planning for Historic Preservation (3) Planning for preservation, restoration and conservation of historic buildings, areas and sites as related to comprehensive and area planning processes. National, state, and local government role in preservation, designa-

5180 Planning Analysis and Forecasting (4) Methods of analysis and modeling in urban and regional studies. Population, employment, and economic base studies with emphasis on forecasting techniques. Prereq: 5130. Sp

5230 Urban and Site Design (3) Principles of design of residential, commercial, and some components of physical community such as shopping centers, institutional complexes, central business districts. Problems of choosing alternative design against each other or written regulations. Extensive laboratory experience. F, Sp, Su

5235 Advanced Urban and Site Design (3-6) Review of principles of urban and site design and laboratory application to selected project or projects involving three dimensional integrated planning of movement systems, activity patterns and land use. Prereq: 5230 or consent of instructor.

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: 5180. Sp

5300 Regional Planning (3) Making planning process operative in intergovernmental context. Theories of regions and analysis of metro planning, area planning, regional planning by states, single-purpose agency planning, and TVA. Prereq: 5110 or consent of instructor.

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: 5110 or consent of instructor.

5340 Implementation (3) Policy formulation, information systems, taxation, capital improvement programming, and other aspects of planning implementation. Programming public actions to affect development. Prereq: 5440. W


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 structure, 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. F, Su

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.
Graduate School of Social Work

Ben P. Granger, Dean
Lou M. Beasley, Branch Director, Nashville
M. Kate Mullins, Branch Director, Memphis
Roger M. Nooe, Branch Director, Knoxville
Ronald K. Green, Director, Office of Continuing Social Work Education

Graduate 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 37996-3910.

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 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.

THE SPECIALIZATION

The curriculum outlined below for the spring quarter, first year, and for the second year shows typical programs for students after they have completed the core curriculum. A student may earn 9 hours of elective credit through completion of a Master's thesis.

Spring Quarter, First Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>5420</td>
<td>Social Work Practice I</td>
<td>3</td>
</tr>
<tr>
<td>5110</td>
<td>Social Welfare Policy and Services I</td>
<td>3</td>
</tr>
<tr>
<td>5210</td>
<td>Human Behavior and Social Environment I</td>
<td>3</td>
</tr>
<tr>
<td>5410</td>
<td>Social Work Practice II</td>
<td>3</td>
</tr>
<tr>
<td>5910</td>
<td>Field Practice</td>
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Winter Quarter, First Year

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<tr>
<td>5940</td>
<td>Field Practice</td>
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<td>5420</td>
<td>Social Work Practice II</td>
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<td>5220</td>
<td>Human Behavior and Social Environment II</td>
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<td>Social Work Practice II</td>
<td>3</td>
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<tr>
<td>5920</td>
<td>Field Practice</td>
<td>4</td>
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<tr>
<td>TOTAL QUARTER HOURS</td>
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</table>

THE 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.

Winter Quarter, Second Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>5950</td>
<td>Field Practice</td>
<td>8</td>
</tr>
<tr>
<td>5961</td>
<td>Integrative Seminar</td>
<td>2</td>
</tr>
<tr>
<td>One Elective</td>
<td></td>
<td>2 or 3</td>
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<tr>
<td>TOTAL QUARTER HOURS</td>
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<td>10 or 11</td>
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Spring Quarter, Second Year

<table>
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<th>Course Name</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>5870</td>
<td>Social Work Practice II</td>
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<tr>
<td>5210</td>
<td>Human Behavior and Social Environment I</td>
<td>3</td>
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<tr>
<td>5420</td>
<td>Social Work Practice II</td>
<td>3</td>
</tr>
<tr>
<td>5920</td>
<td>Field Practice</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL QUARTER HOURS</td>
<td></td>
<td>15</td>
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</tbody>
</table>

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.
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 72 hours including a maximum of 36 S/NC hours.
9. Performance at a satisfactory level in field practicum, 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 applicant's undergraduate work should be in the social sciences, humanities, physical sciences, and other liberal arts subjects. The student's undergraduate work should be part of an otherwise satisfactory scale, with those falling below the average to 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 37996-3910, telephone (615) 974-3175, or one of the Branch offices. Beginning students are admitted only in the fall quarter. Applications for first-year admission should be filed as early as possible. Minimum of six weeks should be allowed for consideration of the application.

Students intending to apply for financial aid are encouraged to apply for admission to the School as early as possible. By doing so, students should be able to meet financial aid application deadlines, many of which are April 1 for September funding.

To apply for admission, applicants should forward the completed Graduate School Application and payment of a nonrefundable $10 application fee to The Graduate School, The University of Tennessee, Knoxville. Two official transcripts of all undergraduate, graduate, and extension work (except work taken at The University of Tennessee, Knoxville) should be sent to The Graduate School immediately after filing the Graduate School Application.

The completed University of Tennessee School of Social Work Application for Admission and three reference forms should be returned to the Admissions Office of the School of Social Work. If a personal interview is required by the School, the applicant will be contacted by a representative of the School and arrangements made concerning a time and place. Applicants may request a personal interview with a faculty member if they wish.

ACCELERATED PROGRAM
The University of Tennessee School of Social Work has a special accelerated program which allows full-time candidates to complete the M.S.S.W. degree in four quarters. This Accelerated Program is approved by the Council on Social Work Education.

Students who qualify for the Accelerated Program must:
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 in the Knoxville and Memphis branches in March and 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 no later than December 31 for the Memphis and Knoxville programs, and not later than January 31 for the Nashville program.

PART-TIME PROGRAM
Planned part-time programs are available in all three branches of the School. Admission requirements are the same as for full-time study. Course work may be completed over a three- or four-year period. Applications should be made to the School as outlined above.

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 taken at another accredited institution to be transferred into the student's Master's program. Such work must have been taken for graduate resident credit and passed with a B or better. In addition, it must be part of the course 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/N credit is accepted for the field practicum is also accepted.
THE DOCTORAL PROGRAM

The UT School of Social Work offers a Doctoral Program in Social Work. This newly approved Ph.D. program will begin Fall Quarter, 1983.

The focus of social work education at the doctoral level is to foster the intellectual development within students of an attitude of scientific inquiry, competence in applying scientific method to improve and extend the knowledge base of social work practice and commitment to the use of this attitude and competence in leadership roles in social work education, research, and practice.

The character of the UT School of Social Work doctoral program will be derived from its focus upon:

—Analysis and evaluation of the interrelationships between direct intervention and planning practice and between each of them and their social policy, programmatic, organizational and community context.

—Development, within this interrelational framework, or research-based knowledge to inform and guide social work practice, social policy, planning and social welfare program development.

The core courses will be offered in four quarters on the Knoxville campus. After this, students will be assigned to one of the three branches for an internship and to complete dissertation research under the supervision of qualified faculty. For example, students interested in health care could be assigned to the Memphis Branch where there are opportunities for internships and for research in health care. Requirements for admission to the doctoral program are being developed. Inquiries and requests for admission should be sent to:

Doctoral Program Admissions, UT School of Social Work, 155 Graduate School of Social Work 155
Graduate School of Social Work 155

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. Ohio State; R. B. Borovitch, D.S.W., Washington; G. C. Fryer, E.D., Columbia; G. McLear (Emeritus), M.S.S.W., Tennesse; M. K. Mullins, Ph.D. Chicago; R. M. Noe, D.S.W., Tulane; B. Orchard (Emeritus), M.S. Western Reserve; S. W. Spencer (Emeritus), M.S. New York School of Social Work.

Associate Professors:

G. W. Ayers, D.S.W., Tulane; L. M. Beaslie, Ph.D. Denver; W. J. Bell, D.S.W., Tulane; J. R. Bates, Ph.D., Michigan; C. T. Cruitts, D.S.W., Tulane; J. C. Eades, Ph.D. Southern Illinois (Carbondale); M. E. Farrow, D.S.W., Pittsburgh; R. K. Green, J.D., Tennessee; C. F. Hairston, Ph.D. Western Reserve; H. Hirayama, D.S.W., Pennsylvania; E. K. Marshall, Ph.D. St. Louis; A. E. Moses, D.S.W., California (Berkeley); R. B. Rowen, Ph.D. Arizona; N. P. Tate, Ph.D. Brandeis; H. W. Vaughn, M.S.W. Tennessee; A. R. Wachter, M.S.S.W., Tennessee; C. S. Wills, Ph.D. St. Louis; P. G. Zezick, M.S.S.W., Wisconsin.

Assistant Professors:

P. M. Campbell, M.S.S.W., Tennessee; M. Celinko, Ph.D. Washington; J. Charing, M.S.S.W., Tennessee; J. F. Clark, Ph.D.; H. P. Coyte, Ph.D. Western Reserve; I. C. Faust, M.S.S.W., Tennessee; A. R. Ford, M.S.W., Atlanta; V. A. Gaten, M.S.S.W., Tennessee; W. D. Harrison, Ph.D. Minnesota; J. Jennings, Ph.D. Michigan; D. C. Johnston, M.S.S.W., California (Berkeley); C. Lowry, M.S.S.W., Tennessee; P. Rose, M.S.S.W., Ohio State; M. P. Strong, M.S.S.W., Tulane; J. F. Thompson, Ph.D. Rutgers.

Courses

5000 Thesis (1-15) P/NP only. E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any four years in which a student uses university facilities and/or faculty time beyond degree requirements as outlined toward degree requirements. May be repeated. S/N only. E

5070-80 Social Work Research I, II (3, 2) Research methodology as applied to problems in social welfare. Prereq: 1000. Problem of mass generation by faculty, students, or social welfare agency or organization. Prereq: 5070-80 and consent of faculty member conducting investigation. S/N only. Sp

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 (2-6) Individual study or research on problems of special significance to student's program, 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 formal policy-making process through which macrosocial 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 delivery systems. Transformation of collective social welfare resources into divisible and indivisible social welfare benefits through organized institutional action of professional nature. W

5130 Social Policy Analysis (2-3) "Policy science" techniques are considered for appropriateness in assessing social, political, and economic implications of social policy proposals. Prereq: Completion of core or consent of instructor. Sp

5161 Social Welfare Seminar (2-3) Problem area or field of practice seminar focusing on substantive issues and policy questions in general and interdisciplinary areas. Prereq: Completion of core or consent of instructor. Sp

5290 Special Accelerated Program in Social Work (3-15) Ten-week program providing 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/N only. F

5310 Human Behavior and Social Environment (2-3) Deepens and extends student's knowledge or range of adaptive behavior; continuum of behavior from ontogenic to phenotypic development. Prereq: Second-year status. May be repeated. F

5311 Imaginative Perspectives on the Human Condition (2-3) Examination of usefulness to social work students of prose, drama, and poetry, which illuminate and expand knowledge and appreciation of every person's humanness. Adaptive and mal-adaptive response to ordinary and extraordinary life situations and events, portrayed by creative writers. Artistic representation of molding of human personality and spirit through interaction of persons with one another and with society. Prereq: Completion of core or consent of instructor. F

5312 Psychopathology and Social Deviance (2-3) Theories of and recent research in etiology of psychiatric 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. F

5313 Deviant Behavior of Children and Youth (2-3) Deviant behavior and conduct disorders in children and youth, etiology, symptomatology, and range of social services and treatment modalities. Prereq: Completion of core or consent of instructor. F

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. F

5316 Mental Health and Employment (2-3) Work as major task and role, values and attitudes toward work, labor practices, patterns of employment, effect of changing technological situations and events, portrayal of the individual as a member of society and of the economy. Prereq: Completion of core or consent of instructor. F

5317 Social Work and Black Families (2-3) Historical and contemporary theories regarding Black families, emphasis on Black family structure as a system. Framework to assess and plan for Black families within service delivery systems. Prereq: Completion of core or consent of instructor. F

5401 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 methodology for enhancing the student's ability to use transactional analysis as treatment modality. Prereq: Completion of core or consent of instructor.

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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

5461 Organizational Design of Social Welfare Agencies (2-3) Critical problems of adapting organizational structure and operational patterns to new tasks, objectives, and mandates. Planning and design for new programs and for modification of existing programs for appropriate deployment of resources, personnel, and facilities. Focus on effectiveness and efficiency. Integration of theory and experience for development of practical skills for coping with various levels of supervision; role of administrative or community organization students, or consent of instructor; 5761 or equivalent. Sp

5702 Social Gerontology (2-3) Physical, psychological, and social aspects of aging; economic and policy implications of aging for development of community programs for aging; retirement—phenomenon of modern society. Sp

5765 Integrative Seminar (2) Required seminar for second-year standing. Prereq: Completion of core or consent of instructor. F, W

5782 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 of juvenile court, alternatives to interventions, 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 adjustment to care, treatment, and rehabilitation. Preparation: Special writing, 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 user and family. Prereq: Completion of core or consent of instructor. Sp

5826 Social Work Treatment for Marital Adjustment (2-3) Individual and group counseling, and pre-marital and post-marital counseling. Prereq: Completion of core or consent of instructor. Sp

5830 Law and Social Work (2-3) Basic principles of law which relate to legal problems of social work: civil and criminal law; administration or community organization students, or 5761 or equivalent. Sp

5902 Supervision in Social Work (2-3) Dual roles of supervisor and consultant: distinction between supervision and consultation, including supervision of workers supervising agencies, and administration or community organization students, or 5761 or equivalent. Sp

5920 Social Work Research (3) Techniques of planning, conducting, and evaluating research in social work. Prereq: 5410 concurrently or prior to 5910; 5420 concurrently or prior to 5920. Must be taken in sequence. Required course. S/NC only. F; W

5921-20 Field Practice (3, 4) Instruction and supervised practice in methods of social work with individuals, groups and communities. Prereq: Admission to the School; 5410 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, W

5961 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 professions; graduating student helped to plan toward continuing his/her education and professional development. S/NC only. Sp

5970 Outcomes in Social Work Practice (2-3) Applied social work: evaluation and problem-solving methods in social work service; social work service delivery systems. Prereq: 5920. Must be taken in sequence. S/NC only. Sp

5980 Practicum in Governmental Social Welfare Policy Making (2-3) Practical introduction to progress of legislative and/or administrative policy making at state and/or federal governmental level, through...
assignment of students to offices of elected or appointed proximate policy makers. Limited social welfare policy research activities. Seminar to present normative and descriptive theory about policy-making process, and models of policy analysis. Pre-req: 5110 and consent of instructor. May be repeated.