Institute of Agriculture

W. W. Armistead, Vice President
Bobby H. Pentecost, Assistant Vice President

The Institute of Agriculture traces its history to 1889 when the University was designated as Tennessee's Federal Land-Grant Institution. Under terms of the Federal Land-Grant Act, the University was enabled to offer instruction in agriculture and the mechanic arts for the first time. Since 1889, agricultural programs at the University have been expanded to include research for the development of new knowledge and extension for dissemination of such knowledge to rural people. Thus the Institute of Agriculture has come to include the work of three main divisions: Agricultural Experiment Station, Agricultural Extension Service, and College of Agriculture.

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

Agricultural Experiment Station

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

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

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

The UT-DOE Comparative Animal Research Laboratory is located about twenty miles west of Knoxville near Oak Ridge, where a program of radiobiological research in the field of agriculture is carried out by the Agricultural Experiment Station under contract to the Department of Energy. The program includes research with farm and laboratory animals, with soils, and in applied radiobotany and plant breeding.

Agricultural Extension Service

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

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

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

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

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

College of Agriculture

O. Glen Hall, Dean

Graduate programs of the College of Agriculture are designed to prepare men and women for positions of leadership in industry, state and federal government, teaching, research, and extension.

The graduate student is expected to demonstrate a thorough knowledge of the subject matter in his/her specialized field of study and its relationship to the sociological, economic, and environmental impact on society. The student must demonstrate the ability to plan, conduct, analyze, and report original research. More importantly, emphasis is given to intellectual growth and to the development of scholarly habits of
study, reasoning and analysis to the end that the graduate will continue to grow and develop professionally throughout his/her career.

MASTERS OF SCIENCE PROGRAMS

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

Both majors and minors are available in Agricultural Biology, Agricultural Economics, Agricultural Engineering, Agricultural Extension, Agricultural Mechanization, Animal Science, Forestry, Wildlife and Fisheries Science, and Plant and Soil Science. Majors and minors are offered in Forestry and Wildlife and Fisheries Science, and minors are also available in Animal Science, Food Technology and Science, 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 the faculty advisory committee. The student will work in consultation with the student and will depend upon the student's background, interests, and professional objectives. For example, a student majoring in Agricultural Biology may choose to engage in research in entomology.

Normally, graduate programs will include the thesis requirement. There is, however, a non-thesis option with a major in Agricultural Economics and Rural Sociology and the Department of Forestry, Wildlife and Fisheries. The non-thesis option with a major in Agricultural Economics has the following minimum requirements: 48 hours of course work which 24 hours must be at the 5000-level; 18 hours in agricultural economics; 9 hours of economic theory; 8 hours in quantitative methods in agricultural economics; statistics, or mathematical economics; final comprehensive written and oral examination.

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

1. 50 hours of course work of which 25 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 examinations.

DOCTORAL PROGRAMS

Graduate study programs leading to the Doctor of Philosophy degree in Animal Science, Agricultural Economics, Agricultural Engineering, and Plant and Soil Science are offered in the college.

General Graduate School requirements relative to admission, faculty advisory committees, residence, grades, research, and admission to candidacy for degree apply to all doctoral programs. Special departmental requirements are listed in the following paragraphs.

Agricultural Economics and Rural Sociology

Subject Area Requirements: All candidates pursuing the Doctor of Philosophy degree will be required to demonstrate competence in examinations in the following areas of specialization:

A. A major area of concentration to be selected from the following:
1. Agricultural policy
2. Agricultural marketing and price analysis
3. Farm management and production economics
4. Natural resource economics
5. Rural development

B. The core areas:
1. Agricultural economics
2. Economic theory
3. Mathematical and quantitative methods in agricultural economics

Course Requirements: A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 600 Doctoral Research and Dissertation.

1. Minimum of 108 quarter hours credit in courses beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 600 Doctoral Research and Dissertation.
2. At least 36 quarter hours credit in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. A minimum of 24 quarter hours credit must be completed in related fields outside of animal science.

The specific program of a candidate for the degree of Doctor of Philosophy in Animal Science includes:

1. Minimum of 108 quarter hours credit in courses beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 600 Doctoral Research and Dissertation.
2. At least 36 quarter hours credit in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. A minimum of 24 quarter hours credit must be completed in related fields outside of animal science.

Animal Science

The Department of Animal Science, with support from the Department of Food Technology and Science, offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:

1. Animal nutrition
2. Animal breeding
3. Animal physiology
4. Animal products

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

Additional specific course requirements for the degree of Doctor of Philosophy in Animal Science include:

1. Minimum of 108 quarter hours credit in courses beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 600 Doctoral Research and Dissertation.
2. At least 36 quarter hours credit in courses numbered 5000 and 6000, exclusive of Doctoral Research and Dissertation.
3. A minimum of 24 quarter hours credit must be completed in related fields outside of animal science.

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

Plant and Soil Science

The Department of Plant and Soil Science offers programs leading to the Doctor of Philosophy degree in the following areas of specialization:

1. Soils
2. Plant Breeding and genetics
3. Crop physiology and ecology

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

Some of the specific requirements for the degree are:

1. Minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the Master's thesis. Of this number, students are required to complete a minimum of 36 quarter hours in 600 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.
The specific program of a candidate for the degree of Doctor of Philosophy in Plant and Soil Science will depend upon the interest and qualifications of the candidate. The program of courses and research will be planned with the student in consultation with a faculty advisory committee. The major professor will serve as chairperson of the faculty advisory committee and will direct the research and the preparation of the dissertation.

Departments of Instruction

Agricultural Biology

MAJOR

Agricultural Biology

DEGREE

M.S., Ph.D.

Professors:

C. J. Southards (Head), Ph.D. North Carolina State; J. W. Hilly, Ph.D. Ohio State; L. F. Johnson, Ph.D. Louisiana State; C. D. Pless, Ph.D. Clemson.

Associate Professors:


Assistant Professors:

E. C. Bernard, Ph.D. Georgia; M. R. McLaughlin, Ph.D. Illinois.

3120 Introductory Plant Pathology (4) Principles of plant pathology illustrated by diseases of common agricultural crops. Prereq: Introductory botany or zoology. Graduate credit for non-majors only. (Same as Botany 3130.) 3 hrs and 1 lab.

3210 Economic Entomology (4) Structure, life history, habits and principles of control of important insect pests of farm, garden, orchard, and household. 3 hrs and 1 lab.

3220 Apiculture (3) Biology of the honey bee, with emphasis on beekeeping equipment and apiary management practices relative to pollination of crops and production of honey and beeswax. 2 hrs and 1 lab.

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

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

5000 Thesis (1-15) E

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

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

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 relationships. Prereq: 8 hrs biological science or consent of instructor. (Same as Zoology 5210.) 2 hrs and 2 labs.

5220 Plant Disease Control (3) Basic problems and principles involved in controlling plant diseases. Prereq: 3130.

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

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

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 and zoology 3110, or consent of instructor. 3 hrs and 1 lab.

5310 Special Problems in Plant Pathology or Economic Entomology (1-6) Comprehensive individual study of current problems in economic entomology or plant pathology. May be repeated. Maximum 9 hrs.

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

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; D. W. Brown, Ph.D. Iowa State; C. L. Cleland, Ph.D. Wisconsin; I. Dubov, Ph.D. California (Berkeley); L. K. Fenn, Ph.D. Kentucky; F. O. Leuthold, Ph.D. Wisconsin; B. R. McManus, Ph.D. Purdue; C. B. Sappington, Ph.D. Illinois.

Associate Professors:

J. R. Brooker, Ph.D. Florida; C. M. Cuskeden, Ph.D. Michigan State; T. H. Klindt, Ph.D. Kentucky; D. L. Mclemore, Ph.D. Clemson; S. D. Murray, Ph.D. Tennessee; R. H. Orr, Ph.D. Illinois; R. W. Todd, J.D. Tennessee; B. J. Trenova, Ph.D. Tennessee; O. 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; allocating land, labor, and capital to meet changing technologies; tenant arrangements and use of credit; risks, measures of success. Use and analysis of records; exercises in planning and field trips arranged. Prereq: Agriculture 1110 and Economics 2120. 2 hrs and 1 lab.

4140 Introduction to Agricultural Production Economics (3) Resource allocation, product selection, scale of operation of agricultural firms; aggregate effects of decisions made by individual agricultural firms. 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. S

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

5230 Agricultural Policy Analysis (3) Meaning of agricultural policy in democratic society; relationship of farm groups to pressure groups; agricultural policy; agricultural policy and appraisal of results; policy problems. Prereq: Agriculture 1110 and Economics 2120. F

5330 Land Economics (3) Problems and policies of land use, conservation, development, taxation, and tenure; population growth and demand for land; principles of land tenure, development, 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) Theory of production organization and costs. Application of decision analysis and models to marketing planning and problems of efficiency of plant operation. Market organization, structures, and price policies. Prereq: 3220. W

4710 Agricultural Law (4) Survey of law and application to the farmer, family and agricultural industry. Property, contracts, torts, drainage and water rights, landlord-tenant relationships, taxation and insurance, forms of business organization, estate planning, regulatory laws, and other selected topics. W

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise required during regular quarters. May be repeated. S/NC only. E

5011 Special Problems in Lieu of Thesis (3) E

5120 Agricultural Price Analysis (3) Analysis and interpretation of factors affecting agricultural prices; price trends and cycles; application of economic theory and statistical techniques to agricultural price research. Prereq: 3120 and Statistics 4310 or equivalent. W

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

5210 Seminar: Agricultural Policies (3) Sp

5220 Seminar: Methodology of Research (3) W

5230 Seminar: Adjustments to Industrialization (3) F

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

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

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

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

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

5710 Quantitative Methods in Agricultural Economics (3) Linear programming techniques with em-
Agricultural Engineering

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

4610 Design of Water Control and Waste Utilization Systems (3) Earth dams, irrigation, drainage, land grading, hydraulic transport of wastes, and application of agricultural land. Prereq: 3610 or consent of instructor. 1 hr and 2 labs.

4620 Design of Water Control and Environmental Control (3) Functional planning ad 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

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

5340 Environmental Control in Agricultural Structures (3) Theoretical and experimental studies relating environmental control to design and operation of agricultural structures. Prereq: 3610. 1 hr and 1 lab. Sp

5470 Agricultural Waste Utilization and Disposal (3) Techniques, equipment, and structures for utilizing and disposing of agricultural wastes by land spreading, land application, and treatment and disposal. Prereq: 3620 or consent of instructor. 2 hrs and 1 lab. F

5480 Engineering Properties of Agricultural Materials and Products (3) Fundamental engineering properties of agricultural products and materials related to handling, processing, and utilization. Prereq: Processing and Handling of Agricultural Materials and Systems and Engineering Science and Mechanics 3311. 2 hrs and 1 lab. Sp

5490 Instrumentation in Agricultural Systems (3) Analysis of specific instrumentation needs in agriculture and research problems; principles and design of instrumentation. Prereq: Engineering electronics or consent of instructor. 2 hrs and 1 lab. Sp

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

5710-20 Similitude in Design and Research (3, 3) Dimensional analysis in development of models, theory and types of models, prediction equations; interpretation of data; applications to machinery, soil and water problems, and other agricultural engineering-related problems. Prereq: Engineering Science and Mechanics 3310 and 3311. 2 hrs and 1 lab. F, W.

6000 Doctoral Research and Dissertation (1-6) May be repeated. Maximum 9 hrs.

Agricultural Extension Education

MAJORS

Degree: M.S.

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

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

6110 Selected Topics in Agricultural Extension (3) Lecture, group discussion, and individual study on specialized developments in power and machinery, soil and water, structures, and processing. May be repeated. Maximum 9 hrs.

6400 Agricultural Waste Utilization and Disposal (3) Techniques, equipment, and structures for utilizing and disposing of agricultural wastes by land spreading, land application, and treatment and disposal. Prereq: 3620 or consent of instructor. 2 hrs and 1 lab. F

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

Agricultural Mechanization

4160 Agricultural Waste Utilization and Disposal (3) Techniques, equipment, and structures for utilizing and disposing of agricultural wastes by land spreading, land application, and treatment and disposal. Prereq: 3620 or consent of instructor. 2 hrs and 1 lab. F

5000 Thesis (1-15) E

5100 Research Problems in Agricultural Mechanization (3) Research problems related to recent developments and current practices in agricultural mechanization. May be repeated. Maximum 9 hrs.

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

5410 Agricultural Machinery Systems Analysis (3) Analysis of current field machinery; adaptation planning for sequential operations; machinery for unique and alternate production and harvesting systems; operational management. Prereq: 4210. 2 hrs and 1 lab. Sp, A

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

Agricultural Engineering

MAJORS

Degree: M.S.

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

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

6110 Introduction to Agricultural Extension (3) History, philosophy; organization; teaching methods; relationships with other educational agencies. Graduate credit for non-majors only.

6110-20 Field Studies (3, 3) Supervised work experience conducted in a designated county. Prereq: 3110 and consent of instructor. Requires living off-campus for a specified time.

5000 Thesis (1-15) E

5100 Selected Topics in Agricultural Extension (1-6) May be repeated. Maximum 9 hrs.
Animal Science

MAJOR DEGREES

Animal Science M.S., Ph.D.

Professors:
R. R. Johnson (Head), Ph.D. Ohio State;
K. M. Barth, Ph.D. Rutgers;
M. C. Bell, Ph.D. Oklahoma State;
J. K. Bletner, (Emeritus), Ph.D. Ohio State;
C. C. Chamberlain, Ph.D. Iowa State;
S. L. Harsard (Emeritus), Ph.D. Florida;
R. L. Murphy, Ph.D. Wisconsin;
D. O. Richardson, Ph.D. Ohio State;
H. V. Shirley, Ph.D. Illinois; R. R. Shoode, Ph.D. Iowa State; E. W. Swanson, Ph.D. Missouri;
R. A. A. (Emeritus), A. M. Missouri.

Associate Professors:
W. R. Backus, Ph.D. Tennessee;
G. M. Anderson, Ph.D. Nebraska;
A. M. T. Butts, Ph.D. Tennessee; H. Elner, D.V.M., Ph.D. Illinois; J. P. Hildreth, Ph.D. Michigan State; W. H. Howay, Ph.D.

Oklahoma State; E. R. Lidivilis, M.S. Tennessee;
F. B. Massingouc, Ph.D. Kansas State;
J. W. Oliver, D.V.M., Ph.D. Purdue;
M. Sims, Ph.D. Auburn.

Assistant Professors:
R. E. Cartee, D.V.M. Kansas State;
D. C. Doyle, D.V.M., Ph.D. Cornell;
R. N. Heitmann, Ph.D. Maine;
E. K. Kerker, Ph.D. Virginia Polytechnic Institute;
S. Kincaid, D.V.M., Ph.D. Purdue;
K. R. Robbins, Ph.D. Kansas; R. Schubel, Ph.D. Washington State; J. D. Smalling, Ph.D. Texas A. & M.

3210 Anatomy and Physiology of Farm Animals (4) Structure, function, muscles, blood and microcirculation, and the nervous, cardiovascular, respiratory, digestive, renal and endocrine systems; disease processes and clinical signs. Prerequisite: 3110. 4 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, and the reproductive phenomena. Prerequisite: 3210 or consent of instructor. (Same as Zoology 3220.) 2 hrs and 1 lab. F, W, Sp.

3320 Animal Nutrition (3) Properties, functions, utilization of nutrients, energy, vitamins and minerals; application of physiological principles to the selection and use of feedstuffs; industry, enterprise establishment, systems of production, production practices, herd improvement programs. Alternatives in terms of production responses and economic returns. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, W.

3420 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, herd improvement programs. Alternatives in terms of production responses and economic returns. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W.

4830 Pork Production and Management (4) Integration of principles of selection, nutrition, breeding, physiology and marketing in a complete pork production and management system. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives in terms of production responses and economic returns. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W.

4840 Poultry Production and Management (4) Structure of poultry industry, organization and management of poultry enterprises including rearing, housing, feeding, processing and marketing. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W.

5000 Thesis (1-15) E

5011 Problems in Lieu of Thesis (1-6) May be repeated. Maximum 6 hrs. E.

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

5210 Endocrine Relations in Animal Production (4) Endocrine glands, pituitary gland, thyroid, adrenals, sex glands; hormone preparations for altering growth and reproductive rate of farm animals. Prerequisite: 3210 or consent of instructor. 3 hrs and 1 lab. F, W, Su.

5220 Advanced Experimental Animal Nutrition (3) Principles and techniques in the design, application, and evaluation of nutritional research. 1 hr and 2 labs. F.

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. Prerequisite: 3330. 1 hr and 2 labs. Sp.

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

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

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 responses and economic returns. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. F, Sp.

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, herd improvement programs. Alternatives in terms of production responses and economic returns. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W.

4830 Pork Production and Management (4) Integration of principles of selection, nutrition, breeding, physiology and marketing in a complete pork production and management system. Structure of industry, enterprise establishment, systems of production, production practices and herd improvement programs. Alternatives in terms of production responses and economic returns. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W.

4840 Poultry Production and Management (4) Structure of poultry industry, organization and management of poultry enterprises including rearing, housing, feeding, processing and marketing. Prerequisite: Completion of animal science sophomore and junior core courses or consent of instructor. 3 hrs and 1 lab. W.
6811 Advanced Topics in Animal Products (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hrs.


Food Technology and Science

MAJOR

DEGREE

Food Technology and Science

M.S.

Professors: J. T. Millet (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. Overost, Ph.D. Iowa State.

Associate Professors: B. J. DeMott, Ph.D. Michigan State; S. L. Melton, Ph.D. Tennessee.

Assistant Professors: M. P. Davidson, Ph.D. Washington State; G. W. Davis, Ph.D. Texas A & M; F. A. Draughon, Ph.D. Georgia; J. R. Mount, Ph.D. Ohio State.

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

5140 Food Flavors (3) Food flavor maintenance and development, and the application of current instrumental methods used to control food manufacturing processes. Prereq: 4210 or 4310. 2 hrs and 1 lab. F

5150 Fats and Oils (3) Chemistry of fats and oils, their properties, and food applications. Prereq: 3220 or equivalent. 2 hrs and 1 lab. W, A

5160 Topics in Dairy Microbiology (3) Microbiological principles related to the preparation and use of dairy products. Prereq: 3445, 5010, 5250 or consent of instructor. Sp, A

6211 Advanced Topics in Animal Physiology (1-6) Recent advances and concepts, research techniques, current problems. May be repeated. Maximum 6 hrs. E

6220 Environmental Physiology of Farm Animals (3) Environmental factors and their effects on animal physiology, animal behavior, and the environment. Prereq: 3420 or consent of instructor. 3 hrs. F, W, Sp

6230 Animal Growth and Development (3) Physiological and environmental aspects of growth of farm animals; effects of growth rates on physiological and environmental factors and measurement; interrelationships of animal physiology and environment in terms of productivity and health. Prereq: Consent of instructor. 2 hrs and 1 lab. W, A, A

6240 Food Processing II (4) Principles of principles of experimental design and research in animal science analyzing data from experiments with unbalanced data, testing for interaction, correlation, and multiple regression. Prereq: Statistics 2511 or equivalent. 2 hrs and 1 lab. W

6300 Dairy Products I (4) Procurement, processing and distribution of fluid milk. Manufacturing of frozen and condensed dairy products. 3 hrs and 1 lab. W

840 Meat Science (3) Concepts of meat science, carcass characteristics of meat animals, slaughter, cut-up, selection, curing, freezing and cooking. 2 hrs and 1 lab. W, Sp

4010 Food Technology and Science Seminar (1-3) Review of literature, oral and written reports. May be repeated. Maximum 3 hrs. F, W, Sp

4030 Dairy Products II (4) Principles in the manufacture of butter, cheese and specialized dairy products. Prereq: 3230. 3 hrs and 1 lab. W, A

4110 Cosmetic Chemistry (3) Cosmetics, their formulation and properties. Prereq: Nutrition 3320 or equivalent. 2 hrs and 1 lab. Sp

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

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

4210 Food Additives (3) Substances used in food manufacturing processes, their effects and functions. Prereq: Nutrition 3320 or equivalent.

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

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

4220 Bakery Products (3) Baking ingredients and their interactions during production and storage of bakery products. Prereq: 4130 and Chemistry 2230 or equivalents. 2 hrs and 1 lab. Sp, A

5100 Meat Technology (3) Physical and chemical changes that occur during conversion of muscle to meat; the influence of these changes on sensory characteristics and composition; meat packaging, preservation, and quality control. Prereq: 3840. 2 hrs and 1 lab. Sp, A

5350 Microorganisms Common in Food Products (3) Identification of desirable and undesirable microorganisms in food products and relationship to manufacturing operations, spoilage, and deterioration of food products and plant equipment. Prereq: 4810 or Microbiology 3810. 3 lab.

5640 Microbial Cultures in Foods (3) Physical and chemical environment and metabolism of microorganisms as related to cultured food products. Prereq: 4810 and Microbiology 3810. 2 hrs. and 1 lab. Sp, A

Forestry, Wildlife and Fisheries

MAJORS

DEGREES

Forestry

M.S.

Wildlife and Fisheries Science


Emeritus

4520 Analysis of Physical Properties of Foods (4) Physical properties of foods, materials, water, viscosity, colloids, fats, oils, crystals, color. Quantitation and changes induced by processing. Prereq: 4200 and Agricultural Mechanization 3510 or consent of instructor. 3 hrs and 1 lab. W

4940 Advanced Meat Quality (3) Qualitative and quantitative characteristics of meat and poultry as related to palatability, cookery, preservation, packing, and merchandising. Prereq: 3840. F

5000 Thesis (1-15) E

5190 Seminar (1) Reports and discussions of selected topics from research literature. May be repeated. Maximum 3 hrs. F, W, Sp

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

5130 Food Enzymology (3) Commercial and native enzymes in manufacturing, processing, and spoilage 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. 2 hrs and 1 lab. W

5150 Fats and Oils (3) Application of scientific principles to commercial technology of fats and oils. Prereq: 3210. 2 hrs and 1 lab. W, A

5200 Research (1-9) Research in selected areas. Consent of department head. Credits and hours to be arranged. May be repeated. Maximum 10 hrs. E

5310 Food Products Development (3) Fundamentals of art, science, and technology applied to research, development, and marketing of new food products and products. Prereq: 4210 or 4310. 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: 3220. 2 hrs and 1 lab. W, A

5420 Advanced Food Quality Assurance (3) Applications of current instrumental methods used to control food manufacturing processes. Prereq: 4120. 2 hrs and 1 lab. F

5510 Meat Technology (3) Physical and chemical changes that occur during conversion of muscle to meat; the influence of these changes on sensory characteristics 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, spoilage, and deterioration of food products and plant equipment. Prereq: 4810 or Microbiology 3810. 3 lab.

5640 Microbial Cultures in Foods (3) Physical and chemical environment and metabolism of microorganisms as related to cultured food products. Prereq: 4810 and Microbiology 3810. 2 hrs. and 1 lab. Sp, A

Forestry, Wildlife and Fisheries

MAJORS

DEGREES

Forestry

M.S.

Wildlife and Fisheries Science


Emeritus

G. Schneider (Head), Ph.D. Michigan State; J. W. Barrett, Ph.D. Syracuse; H. A. Core, Ph.D. Syracuse; J. W. Barrett, Ph.D. Wyoming; E. Thor, Ph.D. North Carolina State; F. W. Woods, Ph.D. Tennessee.
Forestry

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

4020 Forest Watershed Management (3) Water as a forest resource; role of forests in the hydrologic cycle; control practices to prevent erosion and land degradation; watershed planning. Prereq: 3230 or consent of instructor. Two overnight field trips. W

4101 Forestry Organization and Administration (3) Planning, organizing, and leadership concepts and cases; problem analysis and decision making in forest resources management. Prereq: Consent of instructor. 3 hrs and 1 lab. W

4220 Forest-Resource Management Plans (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. A

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. W

4300 Forest Policy (3) History of forestry in the United States with emphasis on development of forest resources policies; current policies influencing development and management of forest resources. Prereq: 3320. Sp

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: Forest 3110 or equivalent. 3 hrs and 1 lab. W

5000 Thesis (1-15) E

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

5011 Problem Analysis in Forest Resources (3) Problem oriented, case studies in the application of various forest resources management. Identify, analyze, and prepare written report on a problem. Topic and prerequisites must have approval of all committee members. Formal presentation to faculty and students. Available only to students in the non-thesis option for the M.S. in Forestry. Sp

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

5220 Seminar in Forest Tree Biology (3) Growth, reproduction, and physiology of forest trees: forest ecology, variability and taxonomy of forest trees. Prereq: 3320 or Botany 4310, F, A

5230 Seminar in Forest Management (3) Newly developed systems in forest organization and regulation; financial and operational planning in forest management. Prereq: 4230 or equivalent. W, A

5240 Seminar in Forest Genetics (3) Population genetics and speciation, variation patterns and heritability in forest trees; gains with different breeding methods; planning and conducting forest genetics research. 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; recreation analysis and recreation management. Prereq: 4210. A

5260 Industrial Forestry (3) Structure and analysis of forest industries; administrative services, watershed services, and wildlife; producing multiple services; preparation of a complete plan based on optimizing forest uses. Prereq: 4210. A

5270 Topics in Forest Industries Management (3) Forest industries and rural development. Executives from public and private business sector (concerned with forest industry) conduct classes in selected topics. Prereq: 4230 or consent of instructor. F

5280 Seminar in Forest Biome in (3) Theory and application of forest forest measurements and sampling; tree, log and lumber quality; volume estimation techniques, growth and yield prediction. Prereq: 4003 or consent of instructor. Sp, A

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

Wildlife and Fisheries Science

3320 Wildlife Management (3) Lives and ecological roles of game animals and non-game animals. Focus on legal and economic aspects of their management. 2 hrs and 1 lab. F

4480 Game Birds (4) Biology, classification, identification, distribution, and management of game birds in North America. Prereq: 3320 or 1 yr of zoology. 2 hrs and 2 labs. F

5410 Fish Populations (4) Principles and methods of fish population estimation; sampling techniques and equipment; population dynamics; age and growth. Prereq: Biology 3130, 8 hrs mathematics, or consent of instructor. 3 hrs and 1 lab period. W

5420 Fisheries Management (4) Methods of warm and cold water fisheries management including techniques of biological assessment, public relations, habitat manipulation, and stocking. Prereq: 3130 or consent of instructor. 3 hrs and 1 lab period. Sp

5000 Thesis (1-15) E

*Graduate credit for non-forestry majors only.
Ornamental Horticulture and Landscape Design

MAJOR

Ornamental Horticulture and Landscape Design

M.S.

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

Associate Professors:

Assistant Professors:
L. N. Skold, M.S. Kansas State; M. E. Springer (Emeritus), Ph.D. California (Berkeley); H. D. Swingle (Emeritus), Ph.D. Louisiana State.

DEGREE

Plant and Soil Science

MAJOR

Plant and Soil Science

M.S., Ph.D.

Professors:
L. F. Seitz (Head) Ph.D. North Carolina State; F. F. Beli, Ph.D. Iowa State; B. V. Conger, Ph.D. Washington State; H. A. Fribourg, Ph.D. Iowa State; K. S. Parks, Ph.D. Wisconsin; W.L. Parks, Ph.D. Purdue; J. H. Reynolds, Ph.D. Wisconsin; L. N. Skold, M.S. Kansas State; N. G. Holmgren, M.S. Kansas State; M. E. Springer (Emeritus), Ph.D. California (Berkeley); H. D. Swingle (Emeritus), Ph.D. Louisiana State.

Associate Professors:

Assistant Professors:
L. W. Conger, Ph.D. Minnesota; D. E. Dayton, Ph.D. Nevada/Arizona State; J. W. Conger, Ph.D. Louisana State; D. R. West, Ph.D. Nebraska; J. D. Wolf, Ph.D. Auburn.

3020 Crop Ecology (3) Crops and environment, geographical location: site, heat, light, water and interrelationships, pest resistances as a basis for judgment of cultural practices used to modify environmental factors. Prereq: 8hrs biological science. 2hrs and 1 lab. W

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

5110 Soil Fertility and Fertilizers (3) Properties of soils in relation to plant nutrient availability and uptake. Methods of soil fertility evaluation and principles of fertilizer use. Manufacture and properties of fertilizers. Prereq: 3420. 3hrs and 1 lab. W

5120 Grain and Oil Crops (3) Distribution, improvement, morphology, culture, harvesting, and utilization of corn, small grains, grain sorghum, soybeans and other crops. Prereq: 3130. 8hrs biological science. 2hrs and 1 lab. W

5140 Forage Crops (4) Characteristics, adaptation, improvement, management, and utilization of grasses and legumes for pasturage, hay, and silage. Prereq: 2130. 8hrs biological science. 3hrs and 1 lab. F, Sp

5160 Cotton and Tobacco (4) Characteristics, adaptation, improvement, culture, harvesting, and marketing of cotton and tobacco. Prereq: 2130. 8hrs biological science. 3hrs and 1 lab. F

5180 Fruit Crops Management (4) Soils, planting, cultivation, development of fruit crops plantations, pest control, harvesting, packing, storage, and processing. Prereq: Agricultural Biology 3130 and 3210. 3hrs and 1 lab W

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

3250 Soils in Forestry (3) Soils as a medium for tree growth; relation of physical, chemical, and biological properties of soils to tree growth and management of forest stands as a basis of important soil properties in road location, recreational development, and watershed management. Prereq: 2130. Forestry 3320. 2hrs and 1 lab. W

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

3520 Commercial Production of Warm Season Vegetables (3) Characteristics, economic importance, adaptability, and production for fresh and processing markets; emphasis on green, tomatoes, peppers, cucurbits, sweet corn, and okra. Need not have 3510 as prereq. Prereq: 8hrs biological science. 2hrs 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, ecology, economic importance, control, means of control, types of herbicides, and specific recommendations for various crop and non-crop situations. Prereq: 3120 and 3hrs organic chemistry. 3hrs and 1 lab. Sp

4110 Soil Chemistry (4) Colloidal systems; properties and relations of colloidal soil materials; relations of landscape nurseries, garden centers and chain store outlets. 2hrs and 1 lab. F, Sp

4180 Park Design (4) Design criteria for parks and outdoor recreation systems. Park site selection, analysis, planning and management of recreational facilities and parks. Prereq: 3210 or consent of instructor. May be repeated. Maximum 6 hrs. W

4220 Advanced Turfgrass Management (4) Principles and applications in design, development, and management of golf courses. Selection and utilization of grass varieties and other plant materials and development of specifications for nutritional, chemical, and mechanical maintenance, financing, equipment, labor management, and public relations. Prereq: 4220 and consent of instructor. 2hrs and 2 labs. F

4310 Floriculture I (3) Principles and practices employed in producing cut flower crops. Application of principles of plant physiology as they control flowering, plant quality, and harvesting schedules. Prereq: 3110; Plant and Soil Science 3040 or equivalent. 2hrs and 1 lab. Sp

4320 Floriculture II (3) Principles and practices employed in producing flowering crops in pots and other containers. Analysis of problems associated with growing plants in a very restricted soil volume under controlled environment conditions. Prereq: 3110; Plant and Soil Science 3040 or equivalent. 2hrs and 1 lab. W

4400 Individual Problem Study (1-5) May be repeated. Maximum 50hrs. E

5000 Thesis (1-5) E

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

5210 Golf Course Design, Development, and Management (4) Principles and applications in design, development, and management of golf courses. Selection and utilization of grass varieties and other plant materials and development of specifications for nutritional, chemical, and mechanical maintenance, financing, equipment, labor management, and public relations. Prereq: 4220 and consent of instructor. 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, and general and organic chemistry; and consent of instructor. 2hrs and 2 labs. W

5500 Seminar (1) Current literature and developments in ornamental horticulture and landscape design. May be repeated. Maximum 8hrs. F, W, Sp

4180 or consent of instructor. 2hrs and 1 lab. F, Sp

4120 Landscape Design I (4) Design and development of properties: planning, organization, structure, selection and use of plant and structural materials, methods of presentation, specification, Prereq: Consent of instructor. 2hrs and 1 lab. F, Sp

4140 Landscape Design II (4) Advanced theory of design. Pictorial and abstract approach to landscape design. Emphasis on recreational design from analysis of contemporary trends and objectives, projected needs and development of plans. Prereq: Consent of instructor. 2hrs and 1 lab. W

4150 Wholesale Nursery Management (3) Production and sales of nursery management, location, layout, culture, equipment and facilities. Prereq: 3050 or equivalent. 2hrs and 1 lab. W

4160 Retail Nursery Management (3) Essentials of good nursery management, location, layout and operation of landscape nurseries, garden centers and chain store outlets. 2hrs and 1 lab. F, Sp

4180 Park Design (4) Design criteria for parks and outdoor recreation systems. Park site selection, analysis, planning and management of recreational facilities and parks. Prereq: 3210 or consent of instructor. W, A

5310 Seminar (1) Current developments in wildlife and fisheries science. Required of each graduate student in research major. Prereq: 3230 or consent of instructor. W, A

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

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

5460 Landscape Design 11(4) Advanced theory of design. Pictorial and abstract approach to landscape design. Emphasis on recreational design from analysis of contemporary trends and objectives, projected needs and development of plans. Prereq: Consent of instructor. 2hrs and 1 lab. W
tions of chemical properties to plant nutrient availability. Prereq: 2130 and Physics 1210. 3 hrs and 1 lab. W

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

4250 Agricultural Chemicals and the Environment (4) Characteristics, use, 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. W

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) 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 (3) Experimental design and procedures; effect of different variables on precision of experiments; problems dealing with the analysis of data. Prereq: 3610 or equivalent. W

5340 Soil Physics (3) Chemical and physical relationships among soil, liquid, and gaseous phases of soil mass; relation to plant growth and soil management. Prereq: 4410. 2 hrs and 1 lab. W, A

5370 Advanced Soil Fertility (3) Fundamental concepts and soil chemistry as they relate to nutrient absorption by plant roots; interrelation 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 equivalent and consent of instructor. Sp, A

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

5710 Advanced Plant Genetics (3) Importance of polyploidy in plants; detailed study of genome relationships, genetic recombination, mutation, heterosis, quantitative inheritance, heritability selection, and self-incompatibility systems in relation to genetic principles. Prereq: Basic genetics or consent of instructor. F, A

5720 Quantitative Genetics (3) Genetic constitution of population and changes in gene frequency; recognition and measurement of continuous variation; estimation of variable components and genetic advance under different breeding procedures. Prereq: Basic genetics or consent of instructor. 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 physiologic 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) 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, gibberellins, 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
Romanesque period through neoclassicism with architectural developments to the built environment from (Berkeley); R. T. Quinn, Ph.D. Lehigh.

Advanced examination of relationship of historical and cultural developments to present-day design issues. Changing concepts of ethics, aesthetics, and architectural theory. Independent student projects on topics related to course material. Prereq: 4031 and 4032. Sp

4170 Introduction to Preservation and Restoration (4) History and theory of restoration and preservation. Prereq: Consent of instructor. (Same as Psychology 4900 and Real Estate 4900.) S/NC only. E

4175 Technology of Preservation (4) History of technology and materials, methods analysis and dating, techniques of preservation. W

4311 Historic Preservation Laboratory (8) Directed studies for buildings of historical significance. Techniques of preservation; research of historic methods of construction; and studies of viable uses. Rehabilitation, restoration, preservation, and adaptive uses. F, W, Sp


4733 Structural Design for Protection Against Extreme Hazards (4) Probability, risk, human values, insurance. Survey of possible hazards: floods, fire, hurricanes, and tornadoes, earthquakes, nuclear effects, internal and external explosions. Building code and engineered design of steel, masonry, concrete, and wood structures to resist extreme effects. Protective construction for human and system needs. Fire protection engineering, firephenomena, life safety and analysis, high-rise building fires.


4739 Aesthetics of Engineering Structures (4) Architecture in engineering; theory and utilization of space, design, and materials in large structures. Bridges, exhibition halls, power plants.

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
Graduate programs of the College of Business Administration are designed to prepare men and women to assume executive, managerial and professional positions in the increasingly complex world of domestic and international business and industry, teaching and research, government and institutional management.

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

Graduate Programs
The College of Business Administration offers programs leading to seven advanced degrees: the Doctor of Business Administration, the Doctor of Philosophy with majors in Economics and in Management Science, the Master of Arts and the Master of Arts in College Teaching with a major in Economics, the Master of Science with majors in Economics and Statistics, the Master of Accountancy in Accounting, and the Master of Business Administration. The Department of Management participates with the Department of Psychology in the College of Liberal Arts in offering an intercollegiate program in Industrial and Organization Psychology leading to the Master of Science and Doctor of Philosophy degrees. (See page 93). Also, the department of Management Science offers an intercollegiate program leading to the Master of Science degree. (See page 94.)

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.

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, at Oak Ridge and at the Kingsport University Center. The part-time student carries two courses per term in classes scheduled in the evening hours and, like the full-time student, typically is enrolled in each of the four quarters of the year.

The typical program consists of the MBA core (12 to 17 courses depending upon exemptions based on prior studies) and a concentration/electives block of 8 courses. Unless there is a requirement for the mathematics course and/or the computer science course, the total program would amount to from 60 to 75 quarter hours of graduate credit.

Prerequisites. An entering student must have completed college level mathematics through at least one course in calculus and a course in computer science (preferably FORTRAN) or equivalent, or include these subjects in the MBA program. Those applying for the management science or statistics concentration should have completed the second year of college level calculus before matriculation. Those admitted to the accounting concentration should plan on an additional two quarters for undergraduate course work in accounting which is taken during the first year of the program.

MBA Core. The following courses are required in each student's program unless an exemption from one or more courses is granted as provided below. All courses are 3 credit hours. The core courses are:
Accounting 5010, 5020, 5030; Business Administration 5310; Business Law 5010; Economics 5010, 5020, 5030; Finance 5010, 5020; Management Science 5010, 5020; Marketing 5010, 5020; Statistics 5010, 5020.

1See course description for Mathematics 5051 and 5052 and Office Administration 5050. A student may be required to take a mathematics placement examination prior to the first quarter of enrollment.
The following diagram illustrates the required sequence of core courses in order to satisfy course prerequisites. Matriculating students are expected to plan their programs with their concentration area advisors at or prior to their initial registration.

### Concentration and Electives

An applicant for admission must select a concentration area. However, a change to another area may be requested at any time after entering the program. 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:

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

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

### Exemptions from Core Courses

A student may be exempt from taking Economics 5010, Accounting 5010 and/or Business Law 5010 if equivalent undergraduate courses in these subjects have been completed with grades of C or higher at a regionally accredited institution no more than five years prior to matriculation in the MBA program. 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 18.)

A student's program may be reduced by as much as 15 hours by exemption described above. A minimum of 60 quarter hours is required to earn the degree. If approval is given for exemption from an additional core course, the department head concerned will recommend to the student’s advisor another course in the field to be substituted for the waived course so that the total program includes a minimum of 60 hours.

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

### Other Requirements

The Application for Admission to Candidacy (see page 20) must be approved by two faculty members in the student’s area(s) of concentration and the Assistant Dean for Graduate Programs in the College of Business Administration, signed by the department head, and submitted to the Vice Chancellor for Graduate Studies and Research.
To qualify for the degree, the student must achieve a B average (3.0) or above in courses taken in the concentration area(s) as well as in the overall program and pass a written comprehensive examination during the final quarter of the program. If the results of the written examination are not clearly passing or failing, a supplementary written or oral examination will be given in the same quarter. The complete examination process may be repeated one time, but it may not be taken until the quarter following the first attempt.

Application and Admission. Application materials may be requested from the Graduate Programs Office, College of Business Administration, The University of Tennessee, Knoxville, Tennessee 37916. Applicants whose undergraduate degree is in a field other than business may matriculate in either the summer or fall term. Those with a business degree from an AACSB-accredited institution may matriculate in either the fall or winter term. Application materials, including GMAT scores, should be submitted not later than the following dates:
- Summer matriculation—April 1
- Fall matriculation—August 1
- Winter matriculation—November 1

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

Dual J.D.-MBA Program

The College of Business Administration and the College of Law offer a coordinated dual program leading to the conferral of both Doctor of Jurisprudence and the Master of Business Administration degrees. A student pursuing the dual program may take up to two academic quarters (24 hours) of course work which would be required if the two degrees were to be earned separately.

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 and such approval will be granted, provided, however, that dual program studies be started prior to entry into the last 24 hours required for the J.D. degree and the last 24 hours required for the MBA degree.

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

The College of Law will award credit toward the J.D. degree for acceptable performance in a maximum of 12 quarter hours of approved graduate level courses offered by the College of Business Administration. Three of the 12 quarter hours must be earned in Accounting 5030 or a more advanced accounting course. If College of Law credit is given for such an accounting course, the student may not receive College of Law credit for Legal Accounting (Law College Course 8590).

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

Except while completing the first year courses in the College of Law, students are encouraged to major in the integration of the two programs, and if the student wishes to take courses in both colleges each quarter.

Awarding of Grades. For grade recording purposes in the College of Law for graduate business courses, grades earned will be recorded as Satisfactory or No Credit and will not be included in the computation of the student’s grade average or class standing in the college where such grades are so recorded. The College of Law will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade.

The College of Business Administration will award a grade of Satisfactory for a graduate business course in which the student has earned a B grade or higher and a No Credit for any lower grade. Grades earned in courses of either college may be used on a uniform basis basis for any appropriate purpose in the college offering the course. The student must pass a final written comprehensive examination to receive the MBA degree.

The DBA Program

The basic objective of the Doctor of Business Administration programs is to provide the student with the intellectual competence necessary 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 methods 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, they 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 (FORTRAN IV), and intermediate economic theory (micro and macro).

Course Requirements for the MBA 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, and basic computer science. Approval of student's concentration area and 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, behavioral science, 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 Science Areas. Each student must demonstrate proficiency in the following areas by completing course work indicated or by passing appropriate examinations:

- Economics: Economics 5111, 5121
- 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 included. Graduate work in the field taken at other institutions is considered by the student's committee in determining additional course work required. Available concentration areas are:

- Accounting
- Finance
- Management
- Marketing
- Transportation and logistics

*Students who choose this field as a supporting area take Management 5170 and 5180.

**MBA core courses in this area may not be included.
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.

Preliminary Examinations. Comprehensive written preliminary examinations consisting of two sessions of approximately four hours each in the concentration area and one four-hour session in the supporting area are required of each person working toward the MBA degree. The student's committee may, if they deem it advisable, arrange for oral examinations, and may accept the results of oral examinations only for supporting areas outside the College of Business Administration. These examinations are scheduled twice a year, in early October and early May. The student may opt to sit for all sessions during a single examining period, or may sit for the concentration sessions and the supporting session in two successive periods. A student who fails an area on the first attempt must, if he/she wishes to continue in the program, retake the examination at the next scheduled administration, the results of which shall be final.

Admission to Candidacy. A student may apply for admission to candidacy for the MBA degree after maintenance of at least a B average in course work, successful completion of preliminary 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.) Prior to presenting the research proposal for formal approval, the student must form his/her faculty committee and request the concentration area department head to recommend their appointment by the Vice Chancellor for Graduate Studies and Research. There must be at least two faculty members, one of whom must be from a department (or discipline) outside the concentration area.

Research and Dissertation (minimum of 56 quarter hours). The purpose of the segment is to provide the candidate with a research experience that meets the general standards of the profession. The dissertation is supervised by the candidate's faculty committee, who must certify its completion and acceptability after the candidate's oral defense of his/her research effort.

Other Requirements. For information concerning program admission requirements, academic performance standards, fellowships and assistantships, and general rules and regulations of the Graduate School, see other parts of the College of Business Administration section and the first session of the catalog, "The Graduate School."

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

Admission Requirements
General admission requirements for the Graduate School are stated on pages 11-13. MBA and DBA applicants are required to take the Graduate Management Admission Test (GMAT). Applicants for programs in economics, management science, and statistics must submit results of either the GMAT or the Graduate Record Examination (GRE) aptitude portion. Applicants for management science must meet the quantitative methods prerequisites stated in the program description.

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 11-13), MBA and DBA applicants must submit additional information on forms provided by the College of Business Administration. The application for all programs and supporting materials should be submitted at least three months prior to desired entry date.

The College of Business Administration is associated with other leading graduate schools of business as a member of the Graduate Management Admission Council.

Fellowships and Assistantships
Fellowships. Information concerning non-service fellowships administered by the Graduate School as well as application blanks may be obtained from the office of the Graduate School. Information on College-administered fellowships is available from the Graduate Programs Office of the College of Business Administration.

Assistantships. A limited number of graduate assistantships are available in each of the academic departments and in the Center for Business and Economic Research. Assistantships which carry remission of tuition and/or fees range up to $4500 per year, while others funded through various research centers of the University range up to $5500 per year for half-time service. Awards are generally made on the basis of scholarship and performance on the admission test. Application forms may be obtained in any of the departments of Graduate Programs. Applications must be received by March 1 for consideration of assistantships to be awarded for the following fall term.

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

Management Development Programs
The Management Development Programs 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 analytical thinking and the use of the decision tools, and to examine the economic, political, technological and other environmental factors affecting the firm's operations.

The TEDP limits enrollment to the first six participants who live on-campus for a total of four weeks spread over a three-month period. This arrangement provides executives with extensive opportunities to exchange ideas and operational concepts with contemporaries in other business areas and with TEDP faculty as well. The faculty for the TEDP consists of senior professors who teach business-related subjects in the University's graduate
Departments of Instruction

Accounting and Business Law

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

Accounting

MAJOR DEGREE Accounting M. Acc.


THE MASTER OF ACCOUNTANCY PROGRAM

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

Foundation Requirements. Although the program is designed for students who have completed an accredited baccalaureate degree program in 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 51 quarter hours of graduate course work. Specifically, the student must complete courses in selected business disciplines and in the areas of accounting as indicated below. Each course is 3 quarter hours of graduate credit.

Business Core (21 quarter hours):
- Economics 5030: Finance 5010; Management 5010; Management Science 5010; Marketing 5010; Principles of Accounting 5100.
- Accounting Core (15 quarter hours): Accounting 5110, 5120, 5210, 5420, 5950.
- Accounting Electives (Select five) (15 quarter hours): Accounting 5130-40, 5160, 5220, 5430, 5440, 5510, 5640, 5900.

Each student must pass a final written comprehensive examination during the final quarter of study for the degree.

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only.

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

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. Emphasis on those which have particular significance to business and industry.

5101 Seminar in Accounting Theory (3) Evolution of accounting theory, concepts underlying financial reporting models, and authoritative accounting literature. Prereq: 5010 or coreq: Management Science 5101. F, W

5110 Seminar in Accounting Practice (3) Case studies covering problems and issues relating to financial reporting, analysis, and decision making. Prereq: 5010. S/NC only.

5120 Seminar in Advanced Auditing (3) Theory and concepts underlying the philosophy of auditing as related to current auditing issues. F, W

5130 Seminar in Current Accounting Topics (3) Critical in-depth consideration of current issues in financial accounting literature. Prereq: 4990 or 5110. Must be taken in sequence.

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

5210-20 Seminar in Advanced Managerial Cost Accounting (3) Cost allocation, budgeting, cost variance analysis, and measurement of performance and responsibility accounting concepts. S, N only.

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. F, W

5320 Advanced Auditing (3) Case-oriented, including audit of specific asset, liability, revenue and expense accounts; emphasis on testing and detection of fraud. 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 tax with emphasis on tax planning and research.

5410 Tax Research (3) Development of expertise in tax research utilizing tax service, tax periodicals, legal cases and other available sources. Includes individual research projects. Prereq: 4430 or equivalent.

5420 Tax Planning (3) Advanced study of income tax problems emphasizing alternative available to minimize tax liability compatible with achieving taxpayer objectives. Prereq: 5410.

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

5510 Not-for-Profit Accounting (3) Theory and practice of budgeting and financial accounting, financial reporting, measures of output and accomplishment, and financial and performance auditing for non-profit 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, internal control, implementation, documentation, and control of accounting systems. Prereq: 2130 and knowledge of a computer programming language.

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

5810 Accounting for Control (3) User-oriented survey of contemporary managerial accounting cost accounting topics. Prereq: 5060 or equivalent or consent of instructor. Not available for accounting majors.

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

5950 Seminar in Accounting Research (3) Integration of areas of financial, managerial, tax, and auditing, including directed problem-oriented research in selected topics. Prereq: 5130-40, 5160, 5210, 5420. (Not available to MBA students.)

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

6000 Doctoral Research and Dissertation (3-15) E, F, W

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.

Business Law


5010 Legal and Social Environment of Business (3) Survey of legal and quasi-legal institutions with emphasis on those which have particular significance to business; legal notions and principles that pertain to business relationships. Prereq: 5110-20 or equivalent. F, W

5310 Business Policy (3) Case studies covering policy formulation and administration; point of

Business Administration

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

5310 Business Policy (3) Case studies covering policy formulation and administration; point of
Business Education

See College of Education

Economics

MAJOR

DEGREES

MA, MACT, M.S., Ph.D.

Professors:

P. D. Qadilis (Head), Ph.D. California (Berkeley);
R. L. Bowby, Ph.D. Texas; W. E. Coke,
Ph.D. Virginia; J. D. Sherm, Ph.D. Houston;
C. B. Garrison, Ph.D. Kentucky; J. F. Holly
(Emretius), Ph.D. Clark, H. E. Jansen,
Ph.D. Texas; F. X. Lee, Ph.D. Michigan
State; J. R. Moore, Ph.D. Cornell;
W. C. Neale, Ph.D. London School of Economics;
G. A. Spiva, Ph.D. Texas;
R. H. Wolf, Ph.D. Vanderbilt.

Associate Professors:

S. J. Carroll, Ph.D. Harvard; H. S. Chang, Ph.D.
Vanderbilt; E. Glott, Ph.D. Stanford;
H. R. Granade, Ph.D. Florida; H. W. Herzog,
Ph.D. Maryland; A. Mayhew, Ph.D. Texas;
K. E. Phillips, Ph.D. Washington (Seattle);
A. M. Schiffman, Ph.D. Washington (St. Louis).

Assistant Professors:

D. P. Clark, Ph.D. Michigan State, S. P. Coelen,
Ph.D. Syracuse, C. B. Dorn, B.S. Cornell;
D. L. Kaserman, Ph.D. Florida; N. C. Modeste,
Ph.D. Florida; G. E. Schuler,
Ph.D. Houston.

THE MASTER'S PROGRAM

The minimum requirements for a graduate major in Economics for the Master of Arts and the Master of Science degrees consist of the following: (1) Economics 5111-12 and 5121-22, (2) 9 additional hours in economics at the 5000 level or an equivalent 5910-20-30, (3) an additional 9 hours in economics at the 5000 level or above to be concentrated in one field. Students electing the non-thesis option will be required to pass a final written comprehensive examination.

The requirements for a graduate minor in Economics are as follows: Either (1) 5111-12 and 5121, 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.

MASTER OF ARTS IN COLLEGE TEACHING DEGREE

The requirements for the MACT degree are listed on page 20. A thesis is required.

THE DOCTORAL PROGRAM

Subject Area Requirements

1. Students will be required to demonstrate their competence in the core subject fields as indicated:

a. Economic theory, by a preliminary examination.

b. Economic history, by completing 6 hours in economic history at the 5000 level or above with an average grade of B or better or by satisfying an examining committee.

c. History of economic thought, by completing Economics 5150 and 3 additional hours in the department at the 5000 level with an average grade of B or better or by satisfying an examining committee.

d. Mathematical and quantitative methods in economics by completing Economics 5510, 5190, and 5510 with the average grade of B or better or by satisfying an examining committee.

2. Students will be required to demonstrate their competence by preliminary 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 economics of labor and manpower; international organization; international economics.

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.

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) E

5002 Non-Thesis Graduation Companion (3-15)

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

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

6000 Doctoral Research and Dissertation (3-18) 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: 2110-20-30. (Same as Water Resources Development 4110.)

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

4150 History of Economic Thought (3) Development of economic thought, tools of analysis, and economic views as a social science, together with an analysis of sociocultural conditions which influenced this development. Periods. Prereq: 5011 or equivalent. F

4170-50 Introduction to Mathematical Economics (3, 3) Application of mathematical methods in theoretical study of micro- and macroeconomic phenomena. Designed for beginning graduate students. Prereq: intermediate economic theory or calculus. Must be taken in sequence. Prereq: 5110 and college algebra, calculus, and analytical geometry for the equivalent. F

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

5060 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and optimizing techniques. Prereq: 5011 or equivalent. Prereq or coreq: Statistics 5010 or equivalent. F, W

5060 Managerial Economics (3) Application of economic concepts to business decision making. Analysis and forecasting of demand, cost analysis, pricing behavior, and optimizing techniques. Prereq: 5011 or equivalent. Prereq or coreq: Statistics 5010 or equivalent. F, W

5030 Economic Fluctuations, Forecasting, and Stabilization (3) Macroeconomics of the firm. Determination of level of output, employment and prices for economy as a whole. Implications of alternative fluctuations for individual firm. Role of forecasting techniques and stabilization policies. Prereq: 5101 or equivalent. F, Sp, Su

5110 Microeconomics (3) Basic topics in microeconomics, verbal 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, and theory of derived demand. Prereq: 5110 or equivalent. F, Sp, Su

5112 Microeconomic Theory (3) Fundamental theory of price determination in partial and general equilibrium settings, including theories of preference and consumer behavior production, short and long run profit maximization under conditions of perfect and imperfect competition, demand for factors of production and distribution. Prereq: 4170 and 5111 or equivalent. Sp

5121-22 Macroeconomic Theory (3, 3) Determination of levels of employment and prices for economy as a whole, focusing on relationships between interest rates, price expectations, productivity, and quantity of money, on one hand, and aggregate saving, investment, and liquidity preference on the other. Prereq: intermediate economic theory or equivalent. F, W, Sp

5150 History of Economic Thought (3) Development of economic ideas from Adam Smith to John Maynard Marshall; emphasis given to classical and neoclassical tradition.

5180-90 Mathematical Methods in Economics (3, 3) Applications of basic concepts in differential and integral calculus, difference and differential equations, linear algebra and stochastic models to topics in theory of firm, growth models, game theory, linear programming, and decision making under uncertainty. Prereq: 1 yr of calculus. Sp, F

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

5520 Introduction to Econometrics (3) Statistical demand analysis, production and cost analysis, distribution of income and wealth; growth and cycles, macroeconomic applications. Should not be taken by students who contemplate taking Economics 6170-6030. Sp

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

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

5740 Seminar in Public Finance (3) Same as Finance 5740. Sp
6710-20 Seminar: Fiscal Theory and Public Finance
squares regression model, and approaches to statistical testing of economic (3) Topics in microeconomic theory. May be re-

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

611 Seminar in Advanced Microeconomic Theory (3) Topics in microeconomic theory. May be re-

6121 Seminar in Advanced Macroeconomic Theory (3) Topics in macroeconomic theory. May be re-

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


INTERNATIONAL TRADE AND ECONOMIC DEVELOPMENT

4230 Problems in International Trade and Economic Development (3) Problems or problem areas of current importance in fields both of international economics and economic development. Prereq: 5310 or 5320. W

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

4232 The Political Economy of Asian Development (3) Description, analysis, and comparison of major economics problems and policies of China, India, and Southeast Asian countries. W

4260 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

5210 Seminar in International Trade Theory (3) Pure theory of international trade. F

5220 Seminar in Economic Development (3) Economic problems of developing countries. F

5250 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

5260 Economic History of the U.S. (3) Interpretation of American economic system; factors in economic structure and policies from colonial times. W

5610 Location and Regional Development Theory (3) Theory of industrial, agricultural, and residential location; economic basis for land use patterns and central places; examination of regional inequalities and national assistance for regional economic development. 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, and regional input-output, linear programming, and econometric models. W


6231-32, 6241-42 Seminar in Economic Development (3, 3, 3) Development and application of analytical tools to problems of economic policy faced by developing regions and countries. W, A, Sp, F

6250 Seminar in European Economic History (3) Selected topics in European economic history. Prereq: Consent of instructor. May be repeated with consent of instructor. W

6260 Seminar in American Economic History (3) Selected topics in American economic history. Prereq: Consent of instructor. May be repeated with consent of instructor. W

6270 Seminar in Economic History of the Third World (3) Selected topics in economic history of societies other than those of Western Europe and English-speaking North America. Prereq: Consent of instructor. May be repeated with consent of department. F, A

6610 Seminar in Regional Analysis (3) Selected topics in regional economic theory and analysis. May be repeated. Maximum 6 hrs. Sp, A

6620 Regional Economics Workshop (3) Selected topics in applied regional research. Emphasis on student participation in model design and estimation, forecasting, simulation, and mathematical and computer programming. May be repeated. Maximum 6 hrs. Sp, A

6650 Seminar in Environment and Resource Economics (3) Topics in environmental quality, natural resource allocation by private markets, and issues in formulating environmental policy. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. Sp, A

INDUSTRIAL ORGANIZATION

4350 Industrial Organization Analysis (3) Monopoly and competition in the United States economy; market structure, market behavior, and economic performance and interrelationships. Prereq: 9 hrs of introductory economics. W

5340 Seminar in Private Enterprise and Public Policy (3) Structural and political problems of contemporary industry; factors in development, and consequences for business conduct and performance; social control of business through antitrust and other government regulation. F

6351-52, 6361-62 Seminar in Industrial Organization Policy (3, 3, 3, 3) Organization of industry in American economy. Emphasis on empirical and analytical techniques used in investigating structure, conduct and performance. 6361-62—Public policy in the United States with respect to industrial structure and business conduct; examination, appraisal, and proposals for change. Sp, A; W, A

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 MANPOWER

4420 Manpower Problems and Policy (3) Current manpower problems and examination of possible solutions. Problems include unemployment, inflation, manpower training and education, poverty and income redistribution, and/or others. Emphasis on applications to understanding manpower problems. Prereq: 2110-20. Sp


5410 Seminar in Labor Manpower Economics (3) Intensive examination of labor and manpower economics literature. Emphasis on problems, analysis and possible solutions. Prereq: Consent of instructor. F

5420 Seminar in Wage and Employment Theory (3) Current and past theories of wage and employment determination. Prereq: 5410, equivalent or consent of instructor. F

6411-12, 6421-22 Seminar in Labor Economics (3, 3, 3) Selected problems chosen for their current interest of continuing significance—development and application of problems and techniques. W, A, W, Sp, A

FINANCE

Profsors:
R. M. Duvali (Head), Ph.D. North Carolina;
L. Anderson, Ph.D. Wisconsin; R. A. Bowit, Ph.D. Washington; W. D. Dotterweich, Ph.D. Pennsylvania; H. L. Johnson, Ph.D. Virginia; E. W. Lambert, Ph.D. Alabama.

Associate Professors:
A. L. Auxier, Ph.D. Iowa; A. B. Bisce, Jr., Ph.D. Florida; J. E. Golden, Ph.D. George Washington; W. C. D. Cotton (Milwaukee); R. E. Sheires, Ph.D. California (Los Angeles); D. L. Stevens, Ph.D. Michigan State.

Assistant Professors:

5002 Non-Thesis Graduate 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/N only. E

6000 Doctoral Research and Dissertation (3-19) E

FINANCE AND INVESTMENTS


5020 Financial Decision Making and Analysis (3) Decision making relating to management of short-term assets and liabilities. Development of theory of capital structure, financing and dividend policy. Introduction to quantitative models for management of financial assets and liabilities. Prereq: 1200, equivalent or consent of instructor. F


5120 Quantitative Techniques in Financial Management (3) Applications of mathematics, probability, and statistics to model building and testing in financial management. Prereq: 2000 or equivalent. W

5130 Financial Administration (3) Cases and readings within firm: refined techniques of analysis; optimal financing decisions; capital cost measurement; financial performance of the liberal corporate financial theory. Prereq: 5020. W

5140 Seminar: Managerial Finance (3) Applications of theory and quantitative techniques to solution of financial management problems. Prereq: 5100 or 5140. F


5120 Quantitative Techniques in Financial Management (3) Applications of mathematics, probability, and statistics to model building and testing in financial management. Prereq: 2000 or equivalent. W

5130 Financial Administration (3) Cases and readings within firm: refined techniques of analysis; optimal financing decisions; capital cost measurement; financial performance of the liberal corporate financial theory. Prereq: 5020. W

5140 Seminar: Managerial Finance (3) Applications of theory and quantitative techniques to solution of financial management problems. Prereq: 5100 or 5140. F


5120 Quantitative Techniques in Financial Management (3) Applications of mathematics, probability, and statistics to model building and testing in financial management. Prereq: 2000 or equivalent. W

5130 Financial Administration (3) Cases and readings within firm: refined techniques of analysis; optimal financing decisions; capital cost measurement; financial performance of the liberal corporate financial theory. Prereq: 5020. W
5420-30 Investments (3, 3) Investment decision process, factors influencing portfolio decisions and securities analysis, stock-price valuation models. Must be taken in sequence. F, W, Sp

5440 Commodity Futures and Stock Options (3) Futures and option exchanges, trading strategies, options arbitrage. Prereq: Economics 5200. W

5800 Executive-In-Residence Seminar for MBA (3) Practical aspects of financial management and investments. Leading industry, banking, and government officials conduct class. Prereq: Consent of department. Sp

5990 Research in Finance (3) Directed research on a topic of mutual interest to the student and staff member. Prereq: 5620. May be repeated. Maximum 6 hrs.


6420 Theory of Finance (3) Theory of financial decision making under conditions of certainty and uncertainty. Application of theory of choice to allocation of financial resources over time with reference to financing decisions, investment decisions, and the determinants of the cost of capital. F

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

MONETARY POLICY AND FINANCIAL INSTITUTIONS

5810 Financial Markets and Intermediaries (3) Capital formation and allocation of capital in U.S. economy 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

5920 Monetary Theory and Policy (3) Relationship of money, credit and liquidity to income, interest rates, employment and prices as well as examination of effect of monetary policy on economic activity. Prereq: Economics 5202 or equivalent. (Same as Economics 5920.) F

5930 Commercial Bank Management (3) Bank management decision-making analysis of changes in banking environment and structure: acquisition and management of funds: current banking problems. Prereq: Consent of instructor. (Same as Economics 5930.) W

6100 Seminar: Monetary Theory (3, 3) Study of money, credit, and liquidity as related to income, interest rates, employment, output, and prices.

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

GOVERNMENTAL FINANCIAL ADMINISTRATION

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

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

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

5740 Seminar in Public Finance (3) Selected topics: public choice, commodity futures markets, public policy, and fiscal dynamics. Prereq: 5710. (Same as Economics 5740.) Sp

5710-20 Seminar: Fiscal Theory and Public Finance (3, 3) Advanced topics in fiscal theory and policy. (Same as Economics 6710-20.)

INSURANCE

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

REAL ESTATE AND URBAN DEVELOPMENT

4900 Aspects of Urban Environment (4) Interdisciplinary course in urban problems. Prereq: Consent of instructor. (Same as Architecture 4900 and Psychology 4900.) S/NC only. E

5110 Urban Economic Analysis (3) Urban economics. Land value and use. Analysis of current urban problems and policies. Prereq: Economics 5050-60 or equivalent. F

5120 Real Estate Analysis (3) Analysis of real estate investment, real estate finance and appraisal theory. Prereq: Economics 5050 or equivalent. W

5130 Housing and Urban Land Markets (3) Analysis of housing demand, supply and location. Segregation and housing discrimination. Impact of urban renewal and public policy on housing markets. Prereq: 5010 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

Professors: H. D. Hutchen (Head), Ph.D. Texas; R. W. B凌 (Ph.D. Stanford); M. Gordon, Ph.D. Virginia Polytechnic Institute; M. C. Rush, Ph.D. Akron; J. E. Thiell, Ph.D. Indiana; C. R. Maddox, Ph.D. Texas; C. W. Neel, Ph.D. Alabama.

Associate Professors: F. A. Chamblin, MBA-Indiana; O. S. Fowler, Ph.D. Georgia; R. C. Maddox, Ph.D. Texas; J. M. Gordon, Ph.D. California; R. W. Boling, Ph.D. Stanford; C. E. Bell (Chairperson), Ph.D. Yale; C. E. Bell (Chairperson), Ph.D. Yale; M. A. M. M. S. Miami (Florida).

4810-02-03 Readings and Research in Personnel Management (1, 2, 3) Prereq: 4460, Statistics 4310, and consent of instructor. E

5000 Thesis (1-15) E

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

5010 Organization Theory and Behavior (3) Application of organization theory, organizational behavior research as a management concept to organizational problems. F, W, Su

5020 Operations Management (3) Management processes of planning, operating and control of production systems. Management concepts and quantitative techniques with systems framework to operating problems. Prereq: 5010; Management Science 5000. F, Sp, Su

5050 Production Management (3) Analysis of production function with emphasis upon application of mathematical-statistical methods. (For MBA students only. Available only as stated on page 35.)

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

5120 Organization Theory II (3) Dynamics of organization leadership, motivation, informal organization. Prereq: 5110.

5130 Managerial Planning and Control (3) Processes of management planning and controlling with emphasis on long-range corporate planning. Sp

5170-80-90 Proseminar in Industrial and Organizational Psychology (3, 3, 3) Introduction to basic concepts and analysis of research in industrial and organizational psychology. Must be taken in sequence during the student's first year. (Same as Psychology 5170-80-90.) F; W; Sp

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

5230 Wage and Salary Administration (3) Analysis of problems, programs, and practices. W

5320 Human Problems in Administration (3) Review and critique of research in industrial human relations. (Same as Psychology 5450.)

5250-60-70 Industrial and Organizational Psychology (1-3, 1-3, 1-3) Reading in industrial and organizational psychology. Prereq: Consent of instructor. S/NC or letter grade. E

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

5410-30-50 Production Management (3, 3, 3) Quantitative approach to solution of production management problems. Prereq: 36 hrs of mathematics and statistics, including 3 hrs of computer programming, or equivalent and consent of instructor.

5610-20 Organizational Behavior (3, 3) Behavioral methodology and perspective, including review of empirical behavioral research in organizations. Must be taken in sequence.

5710 Management of Foreign Operations (3) Analysis of operational environment of international business firms and impact of internal and external factors on managerial decisions. Readings and cases. Sp.

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

6000 Doctoral Research and Dissertation (3-15) 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 evaluation, executive development, group processes, 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 (1-15) Supervised practice. One credit hr for each 30 hrs of such practice. Maximum 15 credits. (Same as Psychology 6900.) E

Management Science

MAJOR

Management Science

Professors: C. E. Bell (Chairperson), Ph.D. Yale; R. S. Garfinkel, Ph.D. Johns Hopkins.

Associate Professor: R. E. Rosenkrall, Ph.D. Georgia Institute of Technology.

Management Science Committee: Members of the Management Science faculty and in addition: R. W. Boling, Management.
These requirements generally are completed by the end of the first year of the program. Preliminary 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 preliminary 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 36 quarter hours of Management Science 6000, Doctoral Research and Dissertation, through which he/she is expected to make a significant contribution to the science. A final oral examination is conducted over the dissertation and such other segments of the program that the faculty committee deems appropriate. This effort, which is beyond the minimum 72 quarter hours of course work, normally is completed in the third year of the program.

Prerequisites for Management Science 6000: Research Mathematicals (3) Assignment, transportation and general linear programming problems; decision theory, Markov chains and queuing. Prerequisite: Statistics 5101 or corequisite: Statistics 5020. May not be taken for credit by students who receive credit for 5310. W, Sp

5100 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5010 Quantitative Analysis for Management Decisions (3) Assignment, transportation and general linear programming problems; decision theory, Markov chains and queuing. Prerequisite: Statistics 5101 or corequisite: Statistics 5020. May not be taken for credit by students who receive credit for 5310. W, Sp

5310-20-30 Management Science Methods (3, 3, 3) Linear programming procedures and sensitivity analysis; transportation problem and introduction to network analysis. Prerequisite: Fundamentals of matrix algebra and differential calculus; proficiency in computer language. (3) Linear programming problems; decision theory, Markov chains and queuing. Prerequisite: Statistics 5101 or corequisite: Statistics 5020. May not be taken for credit by students who receive credit for 5310. W, Sp

5335 Mathematical Programming Computational Systems (2) Practical aspects of using state-of-the-art mathematical programming systems. Students will write compatible matrix generation 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 problems. 5330 may be taken concurrently. Su

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

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

6000 Doctoral Research and Dissertation (3-15) E
5020 Marketing Strategy and Decision Making (3) Management of basic marketing functions. Integration of marketing into total strategic planning decisions in marketing strategy, both domestic and international. Prereq: 5010; Economics 5020. Prereq or consent of instructor. A

5020 Marketing Management (3) Management of basic marketing functions. Case problems and marketing decision simulation. Prereq: 5020 or equivalent.

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

5220 Promotion Management (3) Management of promotional activities within firm: advertising, publicity, and sales promotion. Emphasis on advertising, setting objectives, budgeting, segmentation, media selection, and evaluation of effectiveness. Prereq: 5202. Sp


5300 Marketing Research (3) Investigation and solution of problems; application of research methods to marketing problems. Research on concepts, methods, and techniques. Prereq: 5201; Statistics 5101. F, W

5350 Buyer Behavior Analysis for Marketing (3) Behavioral processes of consumer buying patterns with emphasis on implications for marketing analysis and executive action. Marketing and behavioral sciences. Prereq: 5202. F, Su

5400 Analyzing Market Opportunity for Marketing Decisions (3) Basic determinants of opportunity within markets, framework for identifying and organizing information required to assess market opportunity. Approaches to analyzing buyers in markets, forecasting extent of 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: 5200 and 5350. Sp

5450 International Marketing Management (3) Development and management of international marketing programs. Problems involved in marketing goods and services to foreign markets. Political, cultural, and economic conditions in different countries. Prereq: 5202. W

5590 Research in Marketing (3) Directed research on subject of mutual interest to student and staff member. Prereq: 5200 and 5350. May be repeated. Maximum 8 hrs.

6000 Doctoral Research and Dissertation (3-15) E

6050 Macro/Theoretical Foundations of Marketing (3) Fundamental nature and history of marketing processes. Role of marketing theory in developing marketing discipline and in 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 research tools and techniques to marketing areas of marketing. Prereq: Knowledge of multivariate analysis and consent of instructor. A

6200 Buyer Behavior (3) Behavioral processes of individual consumers and their 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 formation, and consumer satisfaction. Prereq: Consent of instructor. A

6300 Marketing Decision Models (3) Model building process including application of variety of models to marketing decision making. Bayesian analysis, simulation models, brand choice models, stochastic models, dynamic models, and mathematical models. Prereq: Consent of instructor. A

6350 Current Topics in Marketing (3) Specific topics with variable offerings; must by approved by the Graduate Studies Committee. May 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

Professors

Associate Professors

Assistant Professor
H. A. Foggins, DBA Indiana.

5002 Non-Thesis Graduation Completion (3-15) Required for students not otherwise registered during any quarter when such a student uses university facilities and/or faculty time for study. May not be used toward degree requirements. May be repeated. S/N only. E

5600 Survey of Transportation and Logistics (3) Logistical demands made by society and specific users upon nation's transportation system and problems facing carriers and government in meeting these demands. (May not be included in a concentration or minor.) Prereq: 5020 or 6210. W


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

5130 Transportation Management Problems (3) Analysis of significant transportation problem areas with consideration of proposed solutions. Sp

5210 Business Logistics (3) Development of concepts to guide analysis and design of logistics systems. Scope and importance of temporal and spatial decisions in logistics. Emphasis on the development and management integration of physical distribution operations with marketing, production, and other decision areas. F

5220 Physical Distribution Strategy (3) Development and administration of basic logistical policies. Analysis of physical distribution and supply problems with emphasis on executive action. Practical applications through case approach and simulation game. Prereq: 5210; Statistics 5010. Sp

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 toward firms providing services. F

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

5910 Transportation Law and Carrier Liability (3) Legal rights and responsibilities of carriers and users. Procedures before regulatory agencies and analysis of regulatory statutes with appropriate agency and court decisions. Su

5920 Current Topics in Transportation and Logistics (3) Semester and study current policy or problem area in transportation or logistics. Topics selected will be announced prior to each offering. May be repeated. Maximum 8 hrs.

5990 Research in Transportation and Business Logistics (3) Directed independent research on the subject of mutual interest to student and staff member. Prereq: 12 hrs in transportation. May be repeated. Maximum 6 hrs.

5000 Doctoral Research and Dissertation (3-15) E

5110 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 current quantitative methodologies used in transportation and logistics research. Prereq. Statistics 5010 and 5020, Management Science 5010, or equivalents. W

6220 Transportation and Logistical Systems—Analysis and Simulation (3) Directed independent research, analysis, and simulation of transportation or logistics systems. Prereq: 6210. Sp

Office Administration

J. Stallard, Program Director

Professors
D. Reese, Ph.D. Iowa; E. R. Smith, Ph.D. Ohio State; G. A. Waggoner, M.S. Indiana.

Associate Professors

Assistant Professors
P. G. Campbell, M.S. Austin Peay; H. Petra, M.S. Tennessee; C. S. Shifman, 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. Includes written exercises applied to solving communication cases. Emphasis placed on letters and memos as initial sources of ideas in communication 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 intelligible copy from dictation of a wide variety of correspondence; emphasis on competencies needed to meet occupational standards. Prereq: 4410.

4510 Office Management (3) Strategic and operational planning of office objectives; planning and organizing of office objectives, coordinating and controlling responsibilities 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

4610-20-30 Problems in Office Administration (1-3, 1-3, 1-3) Variable hour lab necessary to complete each course. May be repeated. Maximum 3 hrs for each course.

5011 Problems in Lieu of Thesis (3)

5050 Data Processing in Business (3) Fundamentals of data processing, computer programming and applications, systems design. (Available only as stated on page 35.) E

Statistics

MAJOR

DEGREE

Statistics

M.S.

Professors
C. C. Thielen (Head), Ph.D. Virginia Polytechnic Institute; D. S. Chambers, MBA Texas; R. A. McLean, Ph.D. Purdue.
uses university facilities and/or faculty time before degree is completed. May be repeated. SI NC only. E

5010 Probability and Statistical Inference (3) Fundamentals of probability, discrete and continuous probability models, mathematical expectation, and inference concerning means. Prereq or coreq: Mathematics 5002 or equivalent and a computer programming course. May not be taken for credit by students who receive credit for 5110. F, W

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


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

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


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


5312 Statistical Methods (3) Significance testing, applications of Chi-square statistic, analysis of variance, least squares, and linear regression. Prereq: 5311.

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

6050 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 communalties; methods of rotation; interpretation of factors; cluster analysis. Prereq: 6050. Sp

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

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

The College’s news-editorial and advertising sequences are accredited by the American Council on Education for Journalism. It is a member of the American Association of Schools and Departments of Journalism and the Broadcast Education Association.

MASTER OF SCIENCE

The Master of Science degree with a major in Communications is offered for students who primarily desire (1) advanced preparation in effective communication for mass media and other fields of applied communications, or (2) a deeper understanding of the communication process and the social role of the mass media.

The prospective student who is interested in acquiring basic skills in journalism, advertising, or broadcasting is advised to consider a second baccalaureate rather than an advanced degree. (Note: There is no M.S. in Journalism or Advertising or Broadcasting at this institution. Students desiring a major in one of these fields must take the B.S. program.)

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

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

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

The academic track is designed for the student who wishes to emphasize advanced study of the theory and effects of communications. A minimum of 45 hours of approved graduate course work is required:
-12 hours of core courses:
- Communications 5100, 5120, 5140 and 6100,
  the first three of which must be taken during the first two quarters of the student’s program, except with written approval of the Assistant Dean for Graduate Studies for the College.
-24 hours of selected courses within the College, including at least 6 hours at the 5000 level;
-9 hours of thesis work (Communications 5130 or 5140).

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

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

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

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

DOCTOR OF PHILOSOPHY

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

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

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.

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 Graduate Studies Committee; (e) a statement of the applicant's goals and reasons for pursuing the doctoral. Personal interviews with members of the Graduate Studies Committee may be required. Professional experience in some field of communications is a highly desirable criterion for admission.

The following program represents work normally required for an individual with only the Bachelor's degree and no technical competence: (a) prerequisite courses offered by the College of Communications and approved by the major advisor for applicants lacking the necessary academic and/or professional background; (b) core curriculum: 33 hours of course work; (c) primary concentration in Communications: 15-16 hours of course work; (d) secondary concentration in a cognate minor subject normally outside communications: 12 hours of course work; (e) technical competence area in either teaching, research, or administration: 15-18 hours of course work and, for those who lack appropriate professional experience, an internship the equivalent of 9 credit hours; (f) research tool: 12 hours of course work, e.g., statistics, foreign language, or computer science; (g) dissertation: 66 hours of Communications 6000.

The following courses represent the required core curriculum (beyond the Bachelor's degree): Communications 5100, 5120, 5140, 6100, 6200. One of the following: Communications 6300, 6310, 6320.

For the teaching or administrative technical competence area: a one-week, non-credit computer program course and Statistics 5211, or Sociology 5320 and Statistics 4250; a computer program course and Statistics 6000.

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 the preceding November. This information is available from the Dean's Office, 302 Communications Building, 374-3031.

Communications

MAJOR DEGREES

Professors:

J. B. Haxthas, Ph.D. Minnesota; D. G. Hileman, Ph.D. Illinois; D. W. Holl, Ph.D. Northwestern; J. R. Lynn, Ph.D. Southern Illinois; S. K. Zeigler, Ph.D. Michigan State

Associate Professors:

G. A. Everett, Ph.D. Iowa; H. H. Howard, Ph.D. Ohio; E. F. Shaw, Ph.D. Stanford

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (1-15) Required for any full-time student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree requirements are completed. May not be used toward degree requirements. May be repeated. S/NC only. E

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

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


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

5970 Independent Study (3) Reading, research, or projects on special topics in communication. On individual basis, under faculty direction, with consent. May be repeated.

6000 Seminar in Communications Topics (3) Identification, presentation, and analysis of special issues and problems in communication. Organization and strategy in writing research proposals. Prereq: 5100, 5120, 5140. Recommended prereq: 6100 or consent of instructor.

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

6310 Experimental Research Methods in Communications (3) Experimental methods applied to communications research problems. Causal inference from various research designs. Control, single-factor, and multifactor experimental designs. Laboratory and field experiment situations. Prereq: 5120 or consent of instructor. Prereq or coreq: Basic statistics.

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

Advertisements

Professors:

R. Joel (Head), M.A. Wisconsin; A. D. Fletcher, Ph.D. Illinois; D. G. Hileman, Ph.D. Illinois; S. K. Zeigler, Ph.D. Michigan State.

3650 Advertising Copy and Layout (4) Ideas and their translation into persuasive words and pictures. Principles and techniques of copy and layout. Lectures and labs. Prereq: 3600 with grade of "C" or better or consent of instructor. F, W, Sp

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

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

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

4470 Advertising Campaigns (4) Application of theory in planning and execution of campaigns. Market and consumer research; development and allocation of budgets. Choice of appeals and approaches; media selection; preparation of advertisements. Prereq: 3650, 4000 and 4360 or consent of instructor. W, Sp

5310 Current Issues in Advertising (3) Current socioeconomic, legal, ethical, and cultural issues in advertising and communication to determine advertising's role in and responsibility toward society. Emphasis on both marketing and behavioral science aspects of advertising. Consideration of
5610 Public Affairs Broadcasting (3) News and public affairs function in broadcasting stations and networks, including management, economics, personnel utilization, sources of program materials, ethical and legal aspects, and the development, particularly press conferences, interviews, and news specials. Prereq: 3610 or consent of instructor.

5620 Broadcast Law and Regulations (3) Sociopolitical control of broadcasting; effect of laws, regulations, and public pressures upon station policies and practices, with emphasis on critical aspects. Prereq: 5610 or 3610.

5630 Broadcast Documentary Writing (3) Role of documentary in radio and television. Research, writing, and critique of documentary programs. Prereq: 3630 or consent of instructor.

5650 Radio-Television Program Development (3) Planning basic program structures for broadcasting stations. Historical trends in programming and current programming practices as related to audience requirements, governmental policy, and competitive conditions. Individual studies of program development on both local station and network levels. Prereq: 2750 or consent of instructor. Su.

5970 Independent Study (3) E

School of Journalism

Professors: V. A. Robb (Director), Ph.D., Iowa State; L. G. Poolman, Ph.D., North Dakota; J. R. Ownbey, Ph.D., Ohio State; R. A. Shirley, M.A., Tennessee; M. D. S. Keller, Ph.D., Northwestern.

Associate Professors: H. H. Howard, Ph.D., Ohio; I. G. Simpson, M.S. Syracuse


5120 Writing Feature Articles (3) Selection of topics and practice in writing feature articles for newspapers, magazines, and company publications. Prereq: 2220 or consent of instructor. E

5130 Communications Law (3) Statutory law and judicial precedents affecting mass communications media. Bills, contempt of court, invasion of privacy, copyright, broadcasting, advertising and postal communications. Prereq: 4600.

5150 Public Relations (3) Theories and principles of public relations. Overview of PR as a management tool of business, government, and organizations. Cannot be taken for graduate credit by communications majors. E

5170 Public Relations (3) Theory and practice in covering local news and public events. Emphasis on radio and television. Gathering and production of news broadcasts, using tools of broadcast journalism. Prereq: 3610 and 3670 or consent of instructor. 2 hrs. 1 lab. Sp.

5180 Radio-Television Management (3) Business policies and practices of networks and stations. Departmental functions, cost and income figures, sales techniques, promotion, advertising agencies, and governmental regulations. Lectures by commercial broadcasters. Prereq: 2750 or consent of instructor. Sp.

5190 News Media and Society (3) Roles and responsibilities of mass media in society. Critical analysis of mass media performance. Media codes and controls on the media.

5610 Public Affairs Broadcasting (3) News and public affairs function in broadcasting stations and networks, including management, economics, personnel utilization, sources of program materials, ethical and legal aspects, and the development, particularly press conferences, interviews, and news specials. Prereq: 3610 or consent of instructor. W

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5190 News Media and Society (3) Roles and responsibilities of mass media in society. Critical analysis of mass media performance. Media codes and controls on the media.
College of Education

William H. Coffield, Dean
E. Dale Doak, Associate Dean for Undergraduate Programs
Helen B. Watson, Associate Dean for Graduate Studies
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, and school service personnel at 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 experimental and research studies in education.

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 degree, the Specialist in Education degree, and the Doctor of Education and Doctor of Philosophy degrees.

Masters 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.

Bureau of Educational Research and Service

Four major types of activities—research, development, educational services, and publications—are channeled through the Bureau of Educational Research and Service (BERS), located in Claxton Education Building. The research activities relate to the development of research proposals, conducting research, and assisting others in development of research proposals in the College of Education. Developmental activities relate to change efforts in curricular content and instrumental methodology.

Educational services include a wide list of activities such as in-service educational programs, consultant services, and administrative training programs. Official publications of the College of Education are developed through the Bureau. A limited number of graduate student assistantships are available.

The Educational Opportunities Planning Center and the School Planning Laboratory are integral parts of the Bureau of Educational Research and Service.

Educational Opportunities Planning Center

The Educational Opportunities Planning Center (EOPC) works with school districts in the Tennessee-Kentucky area to help meet their desegregation and sex discrimination needs by assisting with needs assessment and by helping develop plans to meet the needs. Staff members provide in-service training for local district personnel. Such training is directed toward solutions of curricular, human relations, and other types of problems created or compounded by school desegregation and sex discrimination. On-site evaluation of locally installed practices and continuing cooperative evaluation of the progress of local programs are additional major efforts. This program is funded by the U.S. Office of Education.

School Planning Laboratory

The School Planning Laboratory (SPL), located in Claxton Education Building, assists schools and colleges in integrating curriculum offerings with architectural designs, organizing regional institutes to promote innovative construction concepts, encouraging full staff utilization to secure an optimal learning environment, facilitating renovative projects within existing buildings, and conducting custodial clinics on proper maintenance techniques. Course work relating specifically to school planning is offered through the Department of Education Administration and Supervision, while two-year graduate assistantships are under the administrative auspices of the Laboratory.

Departments of Instruction

Art and Music Education

C. H. Ball, Head

Art Education

Major

Art Education M.S.

Degree

Professor: J. W. Robertson, Ed.D. Columbia.
Associate Professor: H. N. Hull, Ed.S. Peabody.

The Master of Science degree in Art Education is offered for art teachers, supervisors, and art-trained persons holding
the baccalaureate 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:

<table>
<thead>
<tr>
<th>Quarter Hours</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Art Education 5310, 5320, and electives</td>
</tr>
<tr>
<td>9</td>
<td>Education Curriculum and Instruction 5710, and electives</td>
</tr>
<tr>
<td>9</td>
<td>Minor (selected with committee)</td>
</tr>
<tr>
<td>9</td>
<td>Thesis (Art Education 5000)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Quarter Hours</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Art Education 5210, 5310, 5320, and electives</td>
</tr>
<tr>
<td>9</td>
<td>Education Curriculum and Instruction 5600, and electives</td>
</tr>
<tr>
<td>9</td>
<td>Minor (selected with committee)</td>
</tr>
<tr>
<td>6</td>
<td>Electives</td>
</tr>
</tbody>
</table>

The thesis option requires satisfactory completion of an oral examination prior to the writing of the thesis. The non-thesis option requires satisfactory completion of a 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.

Music Education

<table>
<thead>
<tr>
<th>MAJOR</th>
<th>DEGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music Education</td>
<td>M.S.</td>
</tr>
</tbody>
</table>

Professors:

- C. H. Ball (Head), Ph.D. Peabody;
- A. W. Humphreys, Ed.D. Illinois; W. J. Julian, Ph.D. Northwestern

Associate Professors:


Assistant Professor:

- M. C. Moore, Ph.D. Michigan

Thesis and non-thesis programs lead to the Master of Science degree in music education. Prerequisite preparation: undergraduate degree in music education.

All graduate students in music education must pass proficiency examinations in music theory and applied music.

Requirements for thesis program: 45 quarter hours including:

- One seminar (3 hours)
- 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

Music 5250 The Role of Music in Education (3) For school personnel, other than music teachers, on the role of music in public education. No previous experience in music required. Su
The Master of Science degree in Adult Education is offered for teachers, administrators, counselors, and community specialists. The degree program has two options. A thesis option requires a minimum of 45 hours, with 18 hours in the major field, 15 hours of electives, and 9 hours of thesis preparation. The non-thesis option requires a minimum of 51 hours of course work, 24 hours of electives, and 3 hours of research methods. For each option, 9 hours must be completed in the behavioral sciences. A minor may be developed from the hours allotted to electives. The thesis option requires satisfactory completion of a final oral examination; the non-thesis option requires satisfactory completion of a final written comprehensive examination.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise exempted 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. SNC 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, W, S

5110 Seminar in College Teaching (3) Effective college teaching; testing and measurement; recent research in college instruction; major problems and procedures. Required of candidates for the MACT degree. SNC only. Sp

5360-70-80 Problems in Continuing and Higher Education (1-3, 1-3, 1-3) Independent study of problems and special institutes. SNC only. E

5410 College and University Law—The Legal Environment (3) Legal precedent concerning liability exposure of public institutions of higher education; personal and institutional liability. Basic principles of risk management and liability insurance. Prereg: 5410 and 5420, or consent of instructor. F

5440 American Higher Education (3) Purposes, 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 Education (3) Development, change, trends, processes, and structure of collegiate governance. E

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

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

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

5895-75 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. SNC only. E

5990-70-80 Seminar in Continuing and Higher Education (1-3, 1-3, 1-3) Problems and issues confronting professional in fields of adult or higher education. E

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

See also course listings under the Departments of Curriculum and Instruction, Educational Administration and Supervision, and Educational Psychology and Guidance.
quarter hours of graduate study. If the student has earned the Master's degree, a maximum of 45 hours of the Master's work may be credited to the 90 hour Ed.S. requirement. (45 hours of 5000-level courses are required.) The program must also include the following:

1. A minimum of 12 hours taken in one of the eight areas listed below.

2. A minimum of 12 hours taken within the College of Education in areas other than the student's major area.

3. A minimum of 12 hours taken outside the College of Education.

4. A minimum of 12 hours earned through the writing of a thesis. (Students who have written a thesis for the Master's degree may be exempted from a thesis in the Ed.S. program provided, in the judgment of the student's committee, the thesis meets the standards of research appropriate for the Ed.S. degree.)

5. A minimum of 45 elective hours taken according to a plan jointly developed by the student and the major professor in terms of the student's professional goals.

THE DOCTORAL PROGRAM

The doctoral major 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.

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

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

4110 Education in Cultural Perspective (3) Contribution of anthropological concepts (primarily concepts of culture) to understanding of education processes, problems, and thought in our society and others. (Same as Anthropology 4110.)

4111 Non-Western Education: Anthropological Approaches (3) (Same as Anthropology 4111.)

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

4210 Curriculum in Elementary School Social Studies (3) Survey of current curricular approaches and trends in elementary school social studies. Prereq: Teaching experience or student teaching. Sp, Su.

4215 Teaching Elementary School Science (3) Methods and materials used in teaching science in elementary school. Developmental and diagnostic/ corrective programs. Not open to students with recent courses or background in teaching elementary school science.

4216 Teaching Elementary School Mathematics (3) Methods and materials used in teaching mathematics in elementary school. Developmental and diagnostic/ corrective programs. Not open to students with recent courses or background in teaching elementary school mathematics. W, Su

4217 Teaching Elementary School Language Arts (3) Methods and materials used in teaching language arts in elementary school. Development of functional relationships with other curriculum areas, diagnostic procedures, and corrective work. Not open to students with recent courses or background in teaching elementary school language arts.

4240 Classroom Instructional Organization (3) Developmental understandings and skills relating to group, class, or school educational program development of functional relationships with other curriculum areas, diagnostic procedures, and corrective work. Not open to students with recent courses or background in teaching elementary school language arts.

4250 Initiating the Activities Program (3) Prereq: Educational Psychology 2430, 6 hrs of methods of teaching in elementary school.

4260 Philosophy of Education (3) Truth, knowledge, and values in education. Emphasis on theories of education and educational philosophy. Prereq: 3010, Educational Psychology 2430 or 3810, or equivalent.

4261 Educational Classics (3) Discussion of selected writings on education by Plato, Herbart, Dewey.

4262 Diagnosis and Correction of Classroom Reading Problems (3) Prereq: 3830 or equivalent.

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.

4301 Teaching Developmental Reading (3) Methods and materials used in teaching reading in the elementary school. Includes development of functional relationships with other curriculum areas, diagnostic procedures and remedial work.

4302 Developing Reading Skills in Content Fields (3) Approaches and techniques for teaching reading in content area classrooms of school program. Emphasis on middle school and secondary school programs. Prereq: Consent of instructor.

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

4305-60-70 Problems in Teaching English (3, 3, 3)

4351-61-71 Problems in Teaching Mathematics (3, 3, 3)

4352-62-72 Problems in Teaching Social Studies (3, 3, 3)

4353-63-73 Problems in Teaching Science (3, 3, 3)

4354-64-74 Problems in Teaching Language Arts (3, 3, 3)

4355-65-75 Problems in General Curriculum (3, 3, 3)

4356-66-76 Problems in Instructional Materials (3, 3, 3)

4357-67-77 Problems in Teaching Foreign Languages (3, 3, 3)

4359-69-79 Problems in Teaching Conservation (3, 3, 3)

4381 Problems in Early Childhood Education (3) May be repeated. Maximum 9 hrs. 6 hrs can be taken concurrently.

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.)

4500 Teaching in Kindergarten: Overview (3) Relationships of kindergarten to total elementary program; goals; historical settings and current developments.

4515 Teaching in Kindergarten: Program Development (3) Curriculum planning and organization; classroom management. Prereq: Consent of instructor.

4630 Current Educational Problems (3)

4654 Programs, Methods and Materials in Environmental and Science Education (3) Instructional materials, teaching methods, curricular programs and issues in environmental and science education.

4750 Utilization of Instructional Media (3) Introduces the basic communications process, need for instructional media, instructional development, selection and utilization of media, and basic softwares for instruction. (Same as Library and Information Science 4750 and Vocational-Technical Education 4750.)

4840 Introduction to Data Processing in Education (3) Analysis of current activities in field of educational data processing. Emphasis on curriculum, administrative, and research opportunities in education, using modern electronic data processing machines and machines within the College of Education in areas other than the student's major area.

5000 Thesis (1-15) E

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

5040 Seminar in Elementary School Language Arts (3) Analysis of current issues related to elementary school language arts education. Emphasis on individual student presentations, projects, and investigations. Prereq: At least 1 yr teaching experience (K-8), 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 effects on education in warfare and mass societies; relation of education to manpower planning and technological change; and others.

5100 History of European Education (3) Ancient Greece to development of national school systems.

5110 History of Education (3) Foundations for American education.


5140 Comparative Philosophies of Education (3) Educational theory and policy proposals of the philosophic schools of thought. Prereq: 4260 or equivalent.

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 as source for harmonizing student's educational and cultural needs.

5143 Supervised Readings in Philosophy of Education (3) Prereq: At least 9 hrs history or philosophy of education.

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

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

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 learnings. Prereq: Undergraduate social studies course or equivalent.

5220 Supervised Readings in International Education (3) Supervised readings and research in any area of international education, with emphasis on historical, philosophical and sociological foundations. Prereq: Consent of instructor.

5230 Diagnosis and Remediation of Arithmetic Difficulties (3) Problems in learning arithmetic concepts, techniques, and strategies for diagnosing teaching of arithmetic. Prereq: 5290 or 5295, or consent of instructor. F, Su

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

5250 Secondary School Instruction (3)

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

5280 The Teaching of Language Arts in the Elementary School (3) Critical considerations and practical applications in content and method for the language arts program, grades 1-8. Prereq: 3260 or consent of instructor.

5281 Teaching Social Studies in the Elementary School (3) Recent trends, issues, and research findings. Credit cannot be earned for both 5281 and 5282.

5282 Teaching Science in the Elementary School (3) Trends, issues, and research in content and method for elementary program.

5283 Programs and Materials in Teaching Elementary Science (3) Analysis of new and innovative science program materials, instructional strategies inherent in teaching of these materials. Prereq: 5282 or equivalent, or consent of instructor.

5284 Seminar in Teaching Elementary Science (3) Analysis of research and issues related to elementary science education. Emphasis on individual student presentations, projects, and investigations. Prereq: 3260, 4215, or 5282 or equivalent, or consent of instructor. At least 1 yr teaching experience (K-9).


5291 Programs and Materials in Elementary School Language Arts (3) Programs and special instructional aids associated with language arts. Prereq: 5280 or equivalent, or consent of instructor.

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

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

5303 Methods and Materials for Teaching Critical Reading (3) Instructional techniques, methods, and materials for development of higher level comprehension skills, concepts, and attitudes for creative (or productive) and critical (or evaluative) reading. Prereq: 3280, 4300, 4301, or at least one course in the fundamentals of teaching.

5304 Programs and Materials for Reading Instruction (3) Examination, selection, and use of materials in reading program, distinguishing between approaches and materials for teaching reading. Prereq: 3281 or 4300 or consent of instructor.

5305 Trends and Issues in Teaching Reading (3) Critical analysis of new programs, materials, innovations, and developments in reading. Prereq: An undergraduate course in reading or consent of instructor.

5306 Teaching Reading to the Linguistically Different Learner (3) Language characteristics of special reading problems pertaining to linguistically different learner. Prereq: Undergraduate reading course, 4300 or 4301 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: 5440 or 5280.

5350 Curriculum Development and Evaluation (3)

5360-70 Curriculum Development in the Local School (3, 3)

5365 Mathematics Laboratories in Elementary School (K-6) (3) For elementary school teachers dealing with activity-oriented mathematics laboratory materials and pedagogical strategies. Theoretical considerations and development of curriculum and materials for laboratory. Prereq: Consent of instructor. Sp, Su.

5380 Diagnosis of Remedial Reading Problems (3) Prereq: 4280.

5381 Remediation of Remedial Reading Problems (3) Prereq: 5380 or consent of instructor.

5382 Development Reading Practice (3) Diagnostic and teaching children having developmental and corrective reading needs. Prereq: 4280.

5383 Remedial Reading Practice (3) Prereq: 5381.

5390 Organization and Administration of Reading Programs (3)

5410 The High School Curriculum (3) Theoretical background and experimental approaches.

5530 Curriculum Laboratory for High Schools (3) Production of syllabi, courses of study, source units, and other materials.

5580 Curriculum Planning and Development (3)

5610 Educational Statistics (3)

5620 Problems in Direction and Supervision of Student Teaching (3)

5630 Practicum in the Individualization of Instruction (3) Prereq: 4810-20.

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

5650-60 Curriculum Laboratory for Elementary Schools (3) Production of syllabi, courses of study, source units, and other materials.

5670 Curriculum Laboratory for Early Childhood (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, Su.

5690 Design of Instructional Media (3) Design and application of instructional development model to arrive at solutions to instructional problems, development and design of a learning 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 projectuals, mounting principles, non-photographic slides, and videotaping for producing classroom audiovisual software. Prereq: 5690 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 prototype 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) Utilization of educational television and radio in schools and colleges. Prereq: Consent of instructor.

5695 Research in Instructional Media (3) Media research and development 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.

5710 Techniques of Research in Education (3) Study and application.

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

5790 Career Development: Workshop (1-6) (Same as Educational Psychology 4720).

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

5820 Seminar in the Teaching of Mathematics (3) Analysis of research and teaching strategies related to subject matter and learner problems. Student presentations initiate discussion sessions. Prereq: At least 1 yr teaching experience (mathematics grades 7-12) or consent of instructor. Sp.

5825 Teaching Mathematics in the Middle and Junior High School (3) Problems related to teaching mathematics in middle and junior high schools. Understanding structure of mathematical concepts, strategies, methods, and materials for teaching. Materials suitable for individualized instruction, mathematics laboratories, and independent study. Opportunities for individual projects. Prereq: 3350 or 3751-52 or equivalent. Su.

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

5835 Teaching Mathematics in the Senior High and Community/Junior College (3) Curriculum, teaching, and learning of mathematics. Planning, analysing courses such as algebra, II, trigonometry, analytic geometry and calculus. Prereq: 5751-52 or equivalent. Su.

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

5842 Problems in Education: Early Childhood Education (3) May be repeated. Maximum 9 hrs. Six hrs may be taken concurrently.

5843 Seminar in Early Childhood Education (3) Analysis of research in early childhood education (K-3) with emphasis on application to programs and methods of instruction. Prereq: 5710 or 5600 or equivalent. W.

5844 Mathematics in Early Childhood Education (3) Behavioral characteristics of children in regard to mathematics, content materials and functional instructional settings, and teaching strategies for development of mathematical ideas. Prereq: 3350 or equivalent. Su.

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

5846 Language Arts in Early Childhood Education (3) Language development of young learner with emphasis on teaching methods, procedures, program materials, and instructional strategies related to subject matter and learner problems. Prereq: 3260 and 3260-81 or equivalent. Su.

5850-60-70 Problems in Education: English (3, 3, 3)

5851-61-71 Problems in Education: Mathematics (3, 3, 3)

5852-62-72 Problems in Education: Social Studies (3, 3, 3)

5853-63-73 Problems in Education: Science (3, 3, 3)

5854-64-74 Problems in Education: Language Arts (3, 3, 3)

5855-65-75 Problems in Education: General Curriculum (3, 3, 3)

5856-66-76 Problems in Education: Instructional Materials (3, 3, 3)

5857-67-77 Problems in Education: Foreign Languages (3, 3, 3)

5859-69-79 Problems in Education: Conservation (3, 3, 3)

5899 Field Experience (1-6) Application of curricular and instructional principles, methods, and materials in schools. Program prerequisites must be met.
5000 Seminar in the Teaching of English in the Secondary School (3) Su
5001 Linguistics and the Teacher of English (3) Analysis and application of linguistics in the classroom. Su
5002 Teaching Composition in the High School (3) Techniques and strategies in teaching composition. W
5003 Teaching Fiction in the Secondary School (2) Reading, study, and analysis of literary selections. F
5004 Teaching the Mass Media in the English Classroom (3) Nature of mass media and importance to American education and life. Sp
5005 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
5006 Teaching Poetry in Grades 7-12 (3) Materials and strategies for teaching poetry. F
5007 Teaching Drama in Grades 7-12 (3) Strategies and materials for teaching drama. W
5008 Developing Speaking and Listening Skills in Grades 7-12 (3) Strategies and principles for teaching skills of speaking and listening. Sp
5009 Instructional Theory and Design (3) For those interested in teaching design as it applies to major units of study. Sp
5010 Studies in English Education (3) Reading and interpretation of educational research and materials. W
5130 Introduction to Educational Administration (3) Key behavioral science concepts/constructs and their application in administration. W
5140 Curriculum Workshops in Instructional Improvement (3) Workshops sponsored by College of Education; may be repeated with consent of department. E
5145 Seminar in Elementary School Social Studies Research (3) Seminar in social studies for teaching of social sciences in elementary schools and preparation for research in the field. Prereq: Consent of instructor. W
5290 The Politics of Education (3) Special emphasis on methodologies and organizational behavior. Prereq: Consent of instructor. Sp
5290 Advanced Study in Philosophy in the Elementary School (3) (Continuation of 5640) Consideration of recent and current literature in field and to sound educational practices in guiding learning of children. Prereq: 5640 or consent of instructor. W
5630 Studies in Mathematics Education (3) Research and study in application to teaching of reading; research as it applies to reading investigations. Prereq: 2500-level course in reading. W
5631 Seminar in Reading and Language Arts (3) Topics new to broad area of language arts. Two topics each term chosen by need and instructor(s). Prereq: 5000-level course in reading and in language arts. Su
5640 Seminar in Curriculum and Instruction (1) Required three quarters. S/N only. E
5640 Advanced Study of Methodology in the Elementary School (3) (Continuation of 5640) Consideration of recent and current literature in field and to sound educational practices in guiding learning of children. Prereq: 5640 or consent of instructor. W
5670 Interpretation of Data (3) Types of data in published materials in education: principles of sound interpretation. W
5680 Projects, Programs, and Materials in Social Studies (3) Projects and aids associated with each social science discipline. W
5690 Advanced Seminar in Philosophy of Education (3) Some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.
5681 Phenomenology and Education (3) Selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.
5682 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.
5690 Education as Social Policy (3) Education as instrument of national or cultural well-being; problems faced by society in shaping educational programs; comparisons of education in this country and in other national school language arts. Prereq: Undergraduate course and one graduate course in social studies, or equivalent. Su
6230 Programs for Curriculum Improvement (3) W
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) Basic theories, programs, and practices.
6400 The Dynamics of Educational Change (3) Causes of lag between educational theory and practice; factors useful in reducing this lag. Prereq: 5280 or equivalent and consent of instructor. Sp
6710 Advanced Educational Statistics (3)
6720 Interpretation of Data (3) Types of data in published materials in education: principles of sound interpretation.
6730 Theory and Evaluation in Curriculum Planning (3) Application of principles of evaluation to curriculum programs in elementary and secondary schools. Prereq: 5270 or 5410 or equivalent.
6731 Studies in Curriculum Theory and the Structure of Knowledge (3) Critical analysis of major theories, models, and designs; structures of knowledge and structures of disciplines in elementary and secondary school programs. Prereq: 5270 or 5410 or equivalent.
6740 Curriculum Workshops in Instructional Improvement (3) Observation and participation in workshops sponsored by College of Education; evaluation of workshop approaches to teacher education and instructional improvement.
6750-60-70 Problems in Curriculum and Instruction (3, 3, 3)
6810 Seminar in Methods of Teaching in Social Studies (3) (Continuation of 5640) Consideration of recent and current literature in field and to sound educational practices in guiding learning of children. Prereq: 5640 or consent of instructor. W
6820 Advanced Seminar in Philosophy of Education (3) Some selected philosophical issues in education. Prereq: At least 2 courses in history or philosophy of education.
6830 Studies in Mathematics Education (3) Research and study related to historical trends and issues in mathematics education in United States providing broad perspective on current educational problems and future trends. Prereq: 5630 or consent of instructor.
6850 Principles of Educational Leadership (3) Critical thinking concepts, with application to major problems in instruction, supervision, and administration.
6880 Internship (1-6) Advanced level experiences in application of principles and practices of curriculum development and instructional improvement. Program prerequisites must be met and consent of instructor required. May be repeated. Maximum 12 hrs. S/N only.

Educational Administration and Supervision

MAJOR

DEGREES

Educational Administration and Supervision

M.S., Ed.S., Ed.D.


Programs are planned for (1) students preparing for administrative positions normally found in the educational structure of the state; (2) students preparing for the position of supervisor of education; (3) administrators and supervisors in service who wish to improve their professional competence; (4) students and teachers preparing for teaching positions involving administrative responsibilities; and (6) students preparing for teaching educational administration or for administrative positions in higher education.

In addition to M.S. and Ed.D. degrees, a special two-year graduate program is offered which leads to the Ed.S. (Specialist in Education) degree and which provides advanced preparation for applicants judged to be potentially competent school administrators.

5000 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) May be 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 is completed. May not be used toward degree requirements. May be repeated. S/N only. E
5100 Internship in Educational Administration (3) May be repeated with consent of department. Maximum 6 hrs. E
5130 Introduction to Educational Administration (3) Tasks, functions, and processes of educational administration; organization and structure of educational programs and institutions, within the framework of American culture. F, W, Su
5180-90-200 Educational Specialized Research and Thesis (3, 3, 3) E, W
5220 Philosophy and Theory in Educational Administration (3) Philosophical and theoretical foundations of educational administration, programs and institutions, within the framework of American culture. F, W, Su
5230 Seminar in the Behavioral Sciences in Educational Administration (3) Key behavioral science concepts/constructs and their application in administration such as semantics, communication, leadership, change process, organizations and organizational behavior, motivation and morale, role theory. W, Sp
5290 The Politics of Education (3) Special emphasis on leadership structures, operational beliefs, and communication of ideas with regard to community decisions concerning education. E
5310 School Administration and Civil Rights Issues (3) To help school administrators meet responsibilities and resolve problems stemming from civil rights legislation pertaining to race, sex, and the handicapped. A

*Distinguished Service Professor.
Graduate programs (thesis or non-thesis option) lead to the Master of Science degree with majors in College Student Personnel, Educational Psychology (also with a concentration in school psychology), or Guidance, with concentrations in elementary or secondary guidance; to the Specialist in Education degree, both with concentrations in educational psychology, guidance, school psychology, counselor education, and related fields; to the Doctor of Education degree, and to the Doctor of Psychology. The College of Education awards the Ed.S., Ed.D., and Ph.D. degrees. Application deadlines to Ed.D. are February 1 and May 1; Ed.S. and M.S. deadlines are October 15, February 1, May 1, and July 15.

**4100 Psychology of Sex Role Development**
Examination, from both a theoretical and research basis, of the 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**
Studies and exploration of positive mental health. Application of mental health criteria to a study of one's self based on a battery of tests designed to screen for signs of psychosis, neurosis, and adjustment problems. Prereq: Consent of instructor. MAJORS

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**Professors:**
L.M. Cutler, (Head); Ph.D. Michigan; S. C. Dietz, Ed.D. Arizona State; S. W. Huck, Ph.D. Oklahoma State; S. B. Lord, Ph.D. Indiana; E. W. McClain, Ph.D. Texas, W. A. Poppen, Ph.D. Ohio State; C. L. Thompson, Ph.D. Illinois State; R. L. Williams, Ph.D. George Peabody.

**Associate Professors:**

**Assistant Professors:**

Graduate programs (thesis or non-thesis option) lead to the Master of Science degree with majors in College Student Personnel, Educational Psychology (also with a concentration in school psychology), or Guidance, with concentrations in elementary or secondary guidance; to the Specialist in Education degree, both with concentrations in educational psychology, guidance, school psychology, counselor education, and counseling in college and mental health centers, educational measurement and research, career development, and sex-fair counseling and teaching. 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. are February 1 and May 1; Ed.S. and M.S. deadlines are October 15, February 1, May 1, and July 15.

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**Associate Professors:**

**Assistant Professors:**
5865 Career Development: Field Experience (1-3) Application of career development principles and practices in the community, business, and/or industry. May be taken concurrently or separately. 5865, 5785, 5790, 5860, and/or consent of instructor. May be repeated. Maximum 6 hrs. E

5890 Counseling Theories and Techniques (3) Presentation, demonstration, and application of counseling theories and techniques. Open to students interested in the counseling process. (Same as Psychology 5880.) F, W, Su

5897 Practicum (3) Didactic experiences and counseling simulations in learning laboratory. Coreq: 5890. E

5910-30-50 Problems in Lieu of Thesis (3, 3, 3) Prereq: 5340, 5890, 5897, or consent of instructor. May be repeated with consent of department. Maximum 5 hrs. E

5945 Group Counseling Practicum (3) Supervised practicum in group counseling with children and/or adults. Prereq: 5340, 5890, 5897, and 5940 and consent of instructor. May be repeated with consent of department. Maximum 6 hrs.

5950-60 Theory and Practice of Consultation (3, 3) (Same as Psychology 5950-60.) F, W

5959-69 Practicum in Consultation (2, 2) (Same as Psychology 5959-69.) S/NC only.

5960 Organization and Administration of Counselor Programs (3) Basic principles, procedures, and policies. Prereq: 4150, 4640 or consent of instructor. Sp, Su

5990 Practicum in College Student Personnel (3) Prereq: 5550-60-70 or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. E

6000 Doctoral Research and Dissertation (3-15) E

6040 Seminar in Educational Psychology and Guidance Required 3 quarters. F

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

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

6120 Application of Experimental Research Design in Educational Psychology and Guidance (3) Experimental designs used by researchers in educational psychology, counseling, and college student personnel. Prereq: 6110 or equivalent. W, Sp

6319 Field Work in School Psychology: Level II (2) (Same as Psychology 6319.) W

6550-60-70 Seminar in College Student Personnel (2, 2, 2) Issues in college student personnel, college counseling, student development, etc. Prereq: Consent of instructor, admission to the doctoral program. S/NC only.

6610-20-30 Seminar in Dissertation Proposal Writing (2, 2, 2) Preparation and evaluation of dissertation proposals. Prereq: Two consecutive statistics courses or consent of instructor. F, W, Sp

6650-60-70 Systems Approaches in Psychological Services (3, 3, 3) (Same as Psychology 6650-60-70.) E

6660-69-79 Practicum in School Psychology III (2, 2, 2) (Same as Psychology 6669-69-79.) S/NC only.

6750-60-70 Problems in Educational Psychology and Guidance (3, 3, 3) S/NC only. E

6810 Seminar in Counseling (3) Selected counseling theory, topics, issues. Prereq: 5890 or consent of instructor. May be repeated. F, W, Sp

6900 Doctoral Research and Dissertation (3-15) E

6910 Special Topics Seminar (3) Exploration of specific research or theoretical topics with students who have necessary background. Topic varies from quarter to quarter, depending upon instructor. Prereq: Advanced standing as doctoral student. May be repeated with consent of instructor. E

6941-42-43 Practicum in Guidance, Counseling, and Personnel Services (3, 3, 3) Supervised practice in application of guidance tools and techniques. Minimum 90 hours per quarter. Prereq: 5890 and consent of instructor. E

6950 Counseling Supervision (3) May be repeated with consent of advisor. Prereq: 5890, 5940, 6810, 6941. S/NC only. E

Special Education and Rehabilitation

MAJORS

DEGREES

Special Education

M.S.

Counseling

M.S.

Rehabilitation Counseling

M.S.

Professors:


Associate Professors:


Assistant Professors:


Instructors:


Lecturers:


The Department of Special Education and Rehabilitation provides competency-based programs and experiences to prepare regular, special education, and rehabilitation personnel to work with exceptional persons: children and adults. Specialized courses may be distributed over the several areas of exceptionality with an 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.

Programs lead to the Master of Science degree in Special Education with an emphasis in one of the specialized areas. Among the areas of specialization available is disability evaluation (non-thesis only). For further information write the department head.

EDUCATION OF THE HEARING IMPAIRED

4000 Rehabilitation Practicum (3) Evaluation of client data practicing rehabilitation prognosis. Prereq: 4290. F, Sp

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: Audiology and Speech Pathology 3050. (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 4210.) 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, Su

4220 Language Development of Hearing Impaired II (3) Techniques; various systems by which formal language is presented. Prereq: 4210 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 for hearing impaired person; speech and language development; auditory training, speech reading, manual language and its relation to other forms of communication. Observations and practicum. (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 communications skills and techniques with emphasis on vocabulary development with receptive and expressive fluency. Prereq: 4230 or consent of instructor.

4240 Nature of Hearing Impairments (3) Basic principles of audiology and physiology of hearing; nature and causes of hearing loss; methods and instrumentation for assessment of hearing; interpretation of audiograms; selection and use of hearing aids; relation of audiology services to medical and other rehabilitation disciplines. Observations and practicum. F

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 and hard-of-hearing students in public school education to meet needs of deaf and hard-of-hearing students in residential and integrated settings. W

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

4700 Student Teaching with Hearing Impaired Children (9) Supervised practicum with preschool, day school, and residential pupils. S/NC only. F, W, Sp
4871 Practicum with Hearing Impaired Children (6) S/NC only. F, W, Sp
5220 Linguistics in the Education of the Hearing Impaired (4) Current and developing aspects in linguistics related to hearing impaired. F, Su
5240 Seminar in Language Remediation for the Hearing Impaired (3) Current and recent developments in educational methodologies and resources in the training of language to hearing impaired. Research and materials current in use of various sign language systems and adaptations. Emphasis on approaches which accomodate and assist integration of hearing impaired children in regular classrooms. W, Su
5280 Seminar on Educational Implications of Language Deficiency (3) Readings, discussion, and projects on impact of language deficiency on educational programming for children with language deficiency. Sp, Su
5310-20-30 Manual Communication (2, 2, 2) Basic and advanced skills in fingerspelled and signed forms of communication. Emphasis on ability to express and receive the manual forms. Prereq: Consent of instructor. Must be taken in sequence. F, 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. Sp
5540 Seminar in Language Pathology (3) (Same as Audiology and Speech Pathology 5540.)
5820 Curriculum Development Applied to Programs for the Hearing Impaired (3) Current curriculum trends adapted for hearing impaired individuals. New curriculum options in education of these children. Current education theories for programs for hearing-impaired children. Prereq: Curriculum and Instruction 5580 or equivalent and consent of instructor. 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; 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 periphery studies. Prereq: 4110. E
4810 Student Teaching Mentally Retardation (Pre-existing) Prereq: Major in education of mentally retardation. S/NC only. F, W, Sp
4811 Student Teaching Mentally Retardation (Pre-existing) Prereq: Major in education of mental retardation. S/NC only. F, W, Sp
4922 Student Teaching of the Educable Mentally Retarded (3) Observation and supervised practicum. S/NC only. E
5111 Psychology of Mental Retardation (3) Intellectual 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 school institutions and privately operated schools and workshops. Su
5133 Advanced Curriculum for the Mentally Retarded (3) Educational models, methodologies, and curriculum in education of mentally retarded children and adults. Emphasis on varied curriculum alternatives to retarded child's education. Sp, Su
MULTIPLE DISABILITIES
4130 Education of the Brain-Injured Child (3) Nature of organic damage and the role of the rehabilitation team. Recent research for and development educational, physical, and emotional characteristics; special educational techniques. E
4150 Education Problems of Hospitalized and Homebound Children (3) School and home responsibility for physical care and social relationships, educational adjustment, vocational needs, and cooperation with related service resources. E
4840 Educational Problems of the Cerebral Palseid Child at Home and School (3) Physical, social, and educational needs of paleid; evaluative techniques; related services. A
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 EMOOTIONALLY DISTURBED
4610 Nature and Characteristics of Learning and Behavior Disorders (3) Forms of academic and social indvidualizing characteristics of severity and possible causes, and relationships to each other. Relationships with respect to personality characteristics and development factors. Through behavioral and psychodynamic theory as well as practical situations in which learning and behavior disorders may occur. E
4620 Education of the Emotionally Disturbed Child (3) Managing behaviors, models for instruction, teaching techniques and materials, and teacher-pupil family interpersonal relationship as basic to academic achievement for the pupil. Prereq: 4610. W, Su
4630 Practicum in Residential Settings Serving Children with Disturbing Behavior (3) Practice in scientifically identifying, observing, and recording disturbing behaviors. Initiating behavior changes in coordination with related services. Performed in a tutorial capacity within a residential classroom; and to take part in discussion and evaluation of relevant research and new developments in reinforcement and punisher schedules. Prereq: 4610 and 4620 or consent of instructor. A
4640 Practicum in Public School Systems Serving Children with Disturbing Behavior (3) Problems in teaching. Prereq: Academic tutoring in a teacher/aid capacity within regular classrooms. Significant emphasis and practice on special children and special relationships in the regular classroom setting. Discussion and evaluation of relevant methods and techniques for teaching behavior situation. Prereq: 4610 and 4620 or consent of instructor. A
4924 Student Teaching of the Emotionally Disturbed (9) Individual tutoring and classroom observation and teaching. Prereq or coreq: Curriculum and Instruction 4720 or 4820. S/NC only. A
REHABILITATION COUNSELOR EDUCATION
5100 Orientation to Rehabilitation (3) History, philosophy, and practice of rehabilitation, rehabilitation movement, case finding, intake, diagnosis, physical restoration, counseling, training, placement, follow-up, and evaluation. Prereq: Coreq: 5141, 5142 and 5143, or consent of instructor. Sp
5141-42-43 Approaches to Rehabilitation Counseling (3, 3, 3) Different techniques and methodologies of individual and group counseling with handicapped adults to further develop student's counseling skills. Problem-solving techniques and utilization of alternative modes of counseling procedures in rehabilitation. Prereq: 5140 or consent of instructor. W
DISABILITY EVALUATION EDUCATION
5700 Evaluation and Mobilization of Community Resources (3) Issues, processes, and programs related to community mobilization and integration with emphasis on social and rehabilitation facilities and agencies. Assessment utilization to promote management of rehabilitation services. W
5710 Medical Aspects of Disability (1) Physiology, clinical signs, symptoms and diagnostic procedures related to musculoskeletal, neurological, circulatory, and respiratory diseases/disorders. Effects 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 personnel on evaluation of impairments and administration of appropriate medical treatment. W
5720 Medical Aspects of Disability II (2) Physiology, clinical signs, symptoms and diagnostic procedures related to neoplastic, skin, digestive, genito-urinary, endocrine, mental, and infectious diseases/disorders. Effects 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 personnel on evaluation of impairments and administration of appropriate medical treatment. W
5730 Vocational Assessment in Disability Evaluation (3) Vocational assessment: resource materials; criteria for vocational assessment of disability impairment. Techniques for job analysis and case file vocational assessment experiences. Prereq: Admission to program in disability evaluation or consent of instructor.
GENERAL COURSES

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

3520 Language-Speech Handicapped Child in the Classroom (3) Recognizing and understanding speech problems caused by various internal and external factors; modification of speech development in children; incorporating speech-improving techniques into the curriculum. For students not majoring in speech and hearing.

4350-60-70 Problems in the Education of Exceptional Children (3, 3, 3) Prerequisite: Consent of instructor.

4450-60-70 Clinical Practice in Audiology (1-6, 1-6, 1-6) (Same as Audiology and Speech Pathology 4940.)

4720 Audiology II (4) (Same as Audiology and Speech Pathology 4930.)

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N/C only.

5260 Education of Gifted Children (3) Curricular and social adjustments.

5401 Prescriptive Teaching for Children with Learning Disabilities (3) Diagnostic test materials to assess functional level of ability followed by specific remedial recommendation consistent with functional ability level. Emphasis on reading and mathematics skill development. Materials designed for ethnic population, high interest-low vocabulary, assessing sensory, linguistic, and motor development.

5402 The Exceptional Child in the Regular Classroom (3) Adoption, modification, delivery, and maintenance of instructional activities for exceptional child within regular classroom. Learning and academic considerations stressed. Prerequisite: 5401 or consent of instructor.

5403 Resource Teachers for the Handicapped (3) To help students acquire the skill to maintain mildly handicapped children in regular public education environments; job descriptions and expectations, interpersonal relations, assessments of abilities, modifications of curriculum content, and applied teaching methodologies.

5410 Instructional Media for the Handicapped: Design, Production, and Evaluation of Prototypic Curriculum Materials (9) Perception, communication, and learning theories; media design and advanced production techniques; evaluation procedures. Emphasis on planning and producing prototypical media materials specifically designed to meet needs of handicapped learners. Enrollment limited to persons holding major responsibilities in media for program for handicapped or similar setting. (For Summer Media Institute only.)

5450-60-70 Experience in Teaching and Supervision of Exceptional Children (1-6, 1-6, 1-6) E

5510-20-30 Administrative Practicum in Problems in Institutional Care of Children (3, 3, 3) Physical and social development; business and personnel management; holding major responsibilities in institutions for children, or consent of instructor.

5550-60-70 Problems in the Education of Exceptional Children (3, 3, 3) E

5620 Counseling Parents of Exceptional Children (3) Interpreting exceptionalities (handicapped and gifted) to parents and helping in understanding and acceptance of the child in school/home.


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


5910-20-30 Problems in Lieu of Thesis (3, 3, 3) 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.

Vocational-Technical Education

MAJORS

Agricultural Education: M.S.
Business Education: M.S.
Distributive Education: M.S.
Industrial Education: M.S.
Vocational-Technical Education: M.S., Ed.S., Ed.D.

DEGREES

Agricultural Education: B.S., M.S., Ph.D.
Business Education: B.S., M.A., M.S., Ph.D.
Distributive Education: B.S., M.S., Ph.D.
Industrial Education: M.S., Ph.D.
Vocational-Technical Education: M.S., Ed.S., Ed.D.

College of Education 59
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**
  - Research 18 hrs
  - Electives 6 hrs
  - Thesis Option 9 hrs
  - Problems in Lieu of Thesis Option 9 hrs
  - Course Option 2 15 hrs

Total 45-51 hrs

All course work must be approved by the student’s committee.

The MACT is also available in the business education area.

**THE SPECIALIST PROGRAM**

The Ed.D. degree program, which is a thesis or non-thesis program, is a cooperative undertaking involving all vocational service areas. Options are available in agricultural, business, distributive, and industrial education and in general vocational-technical education.

**THE DOCTORAL PROGRAM**

The comprehensive Ed.D. program in Vocational-Technical Education is designed to provide for achieving professional objective, 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 hrs; service area, 18 hrs; vocational-technical education, 18-27 hrs; cognate fields, 9-18 hrs; research techniques, 15 hrs; and dissertation, 36 hrs. A minimum of 120 hrs above the baccalaureate is required.

**4750 Utilization of Instructional Media (3)** (Same as Curriculum and Instruction 4750 and Library and Information Science 4750)

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) 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 History and Organization of Vocational-Technical Education (3) Fundamental principles and contemporary objectives for vocational-technical education.

5011-21-31 Problems In Lieu of Thesis (3, 3, 3) Problems of the academic, socioeconomic, cultural and/or other handicaps that prevent individuals from succeeding in regular vocational education programs.

5012 Problems in Lieu of Thesis (3) Supervision of program planning, coordination, and instruction. Roles and functions of supervisors.

5013 Principles and Objectives of Vocational-Technical Education (3) Fundamentals of educational programs in establishing placement programs, follow-up procedures, evaluation, and curriculum revision in occupational education.

5300 Occupational Program Development for Disadvantaged Persons (3) Problems of the academic, socioeconomic, cultural and other handicaps that prevent individuals from succeeding in regular vocational education programs.

5310 Supervision of Vocational-Technical Education (3) Supervision of program planning, coordination, and instruction. Roles and functions of supervisors.

5510 Principles and Objectives of Vocational-Technical Education (3) Administrative principles and contemporary objectives for vocational-technical education.

5520 Program Planning and Development in Vocational-Technical Education (3) Planning vocational-technical and work force state, local, and institutional programs; research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.

6210 Curriculum Planning in Vocational-Technical Education (3) Prereq: Curriculum and Instruction 5410 or equivalent.

6220 Program Planning and Development in Vocational-Technical Education (3) Planning vocational-technical and work force state, local, and institutional programs; research in planning, advisory committees, planned change, administrative structures, and evaluation procedures.

6230 Evaluation of Vocational-Technical Education Programs (3)

6310 Administration of Vocational-Technical Education (3) Administrative principles and relationship to educational programs in selected areas of vocational and technical education. S/NC only.

6411-12-13 Internship in Vocational and Technical Education (3, 3, 3) Field experiences in selected areas of vocational and technical education. S/NC only.

**5410 Practicum in Business Education (2, 2, 2)** (3) Aims, principles, practices and problems in construction of business curricula for various types of educational institutions in which business subjects are taught.

4610-20-30 Problems in Business Education (3, 3, 3)

5000 Thesis (1-15) E

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

5011 Problems in Lieu of Thesis (3)

5110 Graduate Seminar in Current Problems (3)

5111-12-13 Graduate Seminar: Current Problems in Business Education (1, 1, 1)

5120 Graduate Seminar in Tests and Measurement (3)

5130 Graduate Seminar in Guidance (3)

5140 Organization and Operation of Area Vocational-Technical Schools (3) (Same as Industrial Education 5140)

5410-20-30 Practicum in Business Education (2, 2, 2)

5510 Evaluation of Research in Business Education (3) (Prereq: Curriculum and Instruction 5610 or equivalent.

5611-21 Problems in Business Education: Typing (3, 3)

5612-22-32 Problems in Business Education: Shorthand (3, 3, 3)

5623-33 Problems in Business Education: Bookkeeping and Accounting (3, 3, 3)

5614 Methods and Materials for Vocational Office Education (3) Methods and materials for vocational office education programs. Development of instructional aids, recent developments and research, individualized instruction, and occupational clusters for VOE.

5624 Problems in Business Education: Clerical Practice (3)

5615-25-35 Problems in Business Education: General Business (3, 3, 3)

5618 Organization and Management of Vocational Office Education Program (3) Developing office occupational programs and industrial programs. Development of instructional aids, recent developments and research, individualized instruction, and occupational clusters for VOE.

5628 Problems in Business Education: Administration (3)

6110-20-30 Current Issues in Business Education (3, 3, 3)

6210-20-30 Advanced Studies in Business Education (3, 3, 3)

6410 Higher Education for Business (3)

**Distributive Education**

4130 Areas of Distribution (3) Marketing, product or service technology, social skills, basic skills, and distribution as these areas affect the distributive education curriculum in secondary and postsecondary programs.

4140 Supervised Distributive Experience (3) Minimum 200 hours experience in approved distributive business; concurrent analytic project.
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 23 quarter hours of work selected from courses numbered 5000 and above are included in the M.S. requirement. Course selection shall be made according to each student's professional interests in health, physical education, safety, or recreation with the approval of the major professor. Non-thesis options are available in all M.S. degree programs. A 3 quarter-hour course in research techniques and/or statistics and/or a seminar in research will be required. Each non-thesis degree candidate will take a final comprehensive examination.

Programs leading to the Master of Public Health are 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 offered in Health Education. See further description under Health Education.

The Doctor of Education degree is offered with a major in Physical Education and two collateral areas of study. The curriculum to be pursued will be determined by the student and a doctoral committee. Selection of this curriculum will be based on the past training, experience, and interest of the student. 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.

**Graduate Assistantships.** A variety of graduate assistantships are offered in health education, physical education, safety education, and recreation to qualified women and men who are graduates of accredited colleges or universities. These assistantships are open to students in the Master's and doctoral programs.

Assistantships are made available by local schools, agencies, and the School of Health, Physical Education, and Recreation in return for part-time services rendered. The services may consist of teaching physical education classes, teaching health classes, teaching safety classes, 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: Health and Safety Division, The University of Tennessee; 1914 Andy Holt Avenue, Knoxville, Tennessee 37916.

**Public Health Traineeships.** A few Public Health Traineeships are offered for Master of Public Health candidates concentrating in community health education. These are provided by the United Public Health Service. Letters should be addressed to: Health and Safety Division, The University of Tennessee, 1914 Andy Holt Avenue, Knoxville, Tennessee 37916.

### Departments of Instruction

#### Division of Health and Safety

**MAJORS**

- Health Education
- Public Health
- Safety Education and Service

**DEGREES**

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

**Professors:**

- R. H. Kline (Chairperson), H.S.D. Indiana
- W. J. Huffman, Ed.D. Illinois

**Associate Professors:**

- C. B. Hamilton, Ph.D.
- Dr. P. H. Oklahoma
- J. Gorski, Dr. P.H.
- California (Los Angeles)
- M. A. Miliken (Emeritus)
- M. A. Yale
- A. F. Thompson, Ph.D.
- Michigan State.

**Assistant Professors:**

- J. Ellison, Ed.D. Tennessee

**Lecturers:**

- M. Duffy, M.D. Pennsylvania
- H. P. Hopkins, Ph.D.
- North Carolina

The Health and Safety Division offers the following degree programs:

- 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.

- Master of Science degree with a major in School Health Education or Safety Education and Service (thesis and non-thesis options). Non-thesis option requires 45 quarter hours of course work.

- Educational Specialist degree in Safety Education and Service.

- Doctor of Education degree in Health Education.

- Doctor of Philosophy degree in Health Education.

#### Public Health

**3000 Foundations of Health Science** (3) In-depth study of content areas relating to personal health for the M.P.H. degree. Various types of educational programs to control the disease covered.

**5120 Community Health Problems—Alcoholism** (3) Explores problems of alcoholism regarding overall health of community. Emphasis placed on factors making alcoholism a serious public health problem. Various types of educational programs to control the disease covered. F

**5130 Community Health Problems—Suicide** (3) Explores problems of suicide regarding overall health of community. W

**5140 Community Health Problems—Death Education** (3) Explores problems of suicide regarding overall health of community. N

**5210 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

**5230 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) Survey of major consumer health and safety problems; selecting, purchasing, and financing of safety and medical services. E

**4411 Instructor's Advanced First Aid and Emergency Care** (3) Designed to teach first aid. Satisfaction completion qualifies one for American National Red Cross Certification as an Advanced First Aid and Emergency Care Instructor. (Applicant must be at least 21 years of age.) Prereq: 3210 or valid Advanced First Aid and Emergency Care Certificate. F, W, Sp

**4420 Drug Abuse Education** (3) Drug abuse problem and suspected causes; pharmacology of drugs and their effect on society and methods of drug abuse education. F, Sp

**4700-10-20 Field Practice in Public Health** (3, 3, 3) Field practice in public health supervision under public health supervision. SNC only. E

**4730 Workshop in Public Health Education** (3-6) For teachers, nurses, case workers, sanitarians, and other voluntary and public health agency personnel, emphasizes the problem-solving approach through small group interaction, case method, and critical incident technique. May be repeated. Su

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

**5902 Non-Thesis Graduation Completion** (3-15)

Required after the non-thesis option. May be registered during any quarter when such a student uses university facilities and/or faculty time before degree completion. May not be used toward degree requirement. May be repeated. SNC only. E

**5910 Field Practice and Seminar in Public Health** (3-5, 3-5, 3-5) Internship or field experience under professional supervision in public health. SNC only. E

**5970-80-90 Field Practice and Seminar in Public Health** (3-5, 3-5, 3-5) Internship or field experience under professional supervision in public health. SNC only. E

**5110 Environmental Health** (3-5) Varied environmental factors within general framework of air, food, water, shelter, transportation as they affect humanity's survival, prevention of disease, performance and enjoyment. Lecture, demonstrations, laboratory, and field practice. Prereq: Consent of instructor. Su

5100 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 in the Focus of Public Health Education (2) Formulation of models of positive health behavior, human life cycle and within communities of types of sickness afflicting individuals and groups. 1 hr and 2 labs. Su

5410 Epidemiology (3) Incidence and prevalence of disease in man. W, Su

5430 Administration of Public Health (3) Administration 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 prejudice and exploration of conflicting theories and divergent styles of practice in community organization and development. Laboratory to delineate a community near campus and to practice, 2 hrs and 4 labs. F

5560 Functions and Roles of the Public Health Educator (3) Professional scene 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 living levels. 1-2 hr lecture and 1-2 hr laboratory per week. F

5580 Physical Activity and Health (5) (Same as Physical Education 5850). W

5750-10-15 Advanced Professional Health Education: Health Planning I, II, III (2-5, 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)


6000 Doctoral Research and Dissertation (3-15) E

6030 Critical Analysis of Writing and Research in Health Education (3) (Same as School Health Education 6030). F

6050-60 Seminar in Health Education (3, 3) (Same as School Health Education 6050-60). W, Sp

6210 Health Aspects of Gerontology (3) Su

6220 Seminar on the Nation's Health (3) F

6230 International Health (3) W

Safety

3520 Principles of General Safety (3) Deals with principles and procedures of general safety. Covers safety problems in school, traffic, recreation, industry, home, and other public areas. E

4010-20-30 Problems in Safety (1-3, 1-3, 1-3) Individual identification and study of current problems in safety. E

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

4420 Advanced Driver and Traffic Safety Education (5) Development of competence in teaching of driver education through multimedia, multi-car, 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 interrelationships in sports injury and control; risk-taking and decision solution strategies; and contributions of sports medicine and psychology to the development of safe behavior in all segments of our environment. F

5300 Problems and Research in Accident Prevention (3) Analysis of safety problems found in wide variety of accidents that occur in community; findings of current research in behavioral sciences as related to variation incidence of accidents. Sp

5340 Organization, Administration, and Supervision of Safety Programs (3) National, state, and local levels, of public and private organizations, in educational, industrial and administrative settings, and supervisory aspects. Basic emphasis on implementation of relevant programs. W

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

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


5870-80-90 Current Issues in Safety Education (1, 1, 1) E

6100-20-30 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

School Health

3210 First Aid and Emergency Care (4) (Same as Public Health 3210). E

3410 School Health Instruction (3) Selection of health content material, teaching methods, and evaluation. 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

3620 The Teaching of Sex Education (3) Trends, content, methods, and materials in sex education. F, W

3650 Methods in Secondary Health Instruction (3) Preparation and presentation of health topics. Teaching method emphasized and student participation stressed. E

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

4810-20-30 Problems in School Health Education (1, 1, 1) Individual identification and study of current problems in school health education. Extensive reading of literature. E

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. W

5010 Problems and Practices in School Health (3) Comprehensive study and analysis of the principles, problems, systems, and trends of health education. W

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 behavior and attitude scales, check lists, questionnaires, surveys, and inventories in evaluation of health instruction. Includes criticism of several commercially 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; assessment and contribution of health instruction, health services, and healthful environment as it 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 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. Su

5720-30-40 Graduate Workshop in Health Education (3-6, 3-6, 3-6) Dealing with special health problems in a concentrated period of time. Su


6000 Doctoral Research and Dissertation (3-15) E

6030 Critical Analysis of Writing and Research in Health Education (3) (Same as School Health Education 6030). F

6050-60 Seminar in Health Education (3, 3) (Same as School Health Education 6050-60). W, Sp

6210 Health Aspects of Gerontology (3) Su

6220 Seminar on the Nation's Health (3) F

6230 International Health (3) W
### Division of Physical Education

**MAJOR**

<table>
<thead>
<tr>
<th>DEGREES</th>
<th>M.S., Ed.D.</th>
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**Professors:**
- J. E. Ackler, M.D., Tennessee; G. F. Brady (Emeritus), Ph.D., Iowa; E. K. Copen (Emeritus), Ph.D., New York; B. O. Crosskey (Chairperson), Ph.D., Illinois; A. J. Kozar, Ph.D., Michigan; W. P. Lemaehm, Ph.D., Iowa; M. G. McCutchen, Ph.D., Iowa; B. A. Plomario (Emeritus), Ed.D.; B. O. Watson, Ph.D., Michigan; G. H. Welch, Ph.D., Florida.

**Associate Professors:**
- E. T. Howley, Ph.D., Wisconsin; B. G. Ulrich, North Carolina (Greensboro); W. J. Morgan, North Carolina.

**Assistant Professors:**

**M.A., North Carolina.**

**Teacher's College, Columbia; B. G. Ulrich.**

**M.A., North Carolina.**

**The Physical Education Division offers the following degree programs:**

1. **Master of Science degree in Physical Education (thesis and non-thesis programs).**

2. **Doctor of Philosophy degree in Physical Education with concentrations in exercise physiology, motor behavior, adapted physical education, and philosophical and sociological foundations.**

### Course Descriptions

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>3050</td>
<td>Rhythmic Analysis (2) Emphasis on analysis of education, and philosophical and sociological foundations.</td>
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<tr>
<td>3090</td>
<td>History of Dance and the Related Arts I (2) Dance history and the arts related to it from the beginning of the nineteenth century.</td>
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<tr>
<td>3150</td>
<td>History of Dance and the Related Arts II (2) Survey of dance and the arts related to it, tracing their development in the twentieth century.</td>
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<tr>
<td>3430</td>
<td>Adaptive Physical Education Laboratory (1) Practical work, including student teaching, supplementing 4110, 4120.</td>
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<tr>
<td>4010</td>
<td>Advanced Modern Technique (2) Development, integration, and synthesis of previous dance vocabulary, emphasizing advanced practice and principles. Prereq: 3050. May be repeated. Max. 6 hrs. Available to dance majors and minors or with consent of instructor.</td>
</tr>
<tr>
<td>4020</td>
<td>Practicum in Dance Production (2) Prereq: Consent of instructor.</td>
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<tr>
<td>4060</td>
<td>Advanced Composition (4) Application of compositional, production, and administrative skills culminating in presentation of two complete choreographic works. Prereq: 3020, 4020.</td>
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<tr>
<td>4070</td>
<td>Stagecraft for Dance Production (2) Equipment, light design, properties, sets, and stage management.</td>
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<tr>
<td>4110</td>
<td>Adaptive Physical Education (3) Classification of all students who require modified programs in physical education, activities and class organization suitable for required or special physical education classes.</td>
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<tr>
<td>4140</td>
<td>Measurement and Evaluation in Physical Education (3) Relationship of measurement and evaluation in physical education. Administration and development of tests and measures of physical fitness, sports skills and knowledge.</td>
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<tr>
<td>4150</td>
<td>Creative Rhythms for Children (3) Methods and materials for grades 1-6. 3 hrs and 1 lab.</td>
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<tr>
<td>4800</td>
<td>Motor Behavior: A Theoretical Perspective (4) Examinations of motor behavior from information processing perspective and applies current research to support theoretical base. Prereq: Senior or graduate standing or consent of instructor.</td>
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<tr>
<td>4890</td>
<td>Motor Behavior Laboratory (2) Beginning experience in instrumentation and methodology for assessing factors related to or affecting motor learning/performace. Prereq or coreq: 4860 or consent of instructor.</td>
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<tr>
<td>5000</td>
<td>Thesis (1-15) E</td>
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<tr>
<td>5002</td>
<td>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</td>
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<tr>
<td>5110</td>
<td>Administrative Problems in Health and Physical Education (3)</td>
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<tr>
<td>5120</td>
<td>Problems of the Curriculum in Physical Education (3)</td>
</tr>
<tr>
<td>5130</td>
<td>Methods in Physical Education (3) Characteristics of different school age levels, and applications of learning procedures in physical activities at these levels.</td>
</tr>
<tr>
<td>5140</td>
<td>Advanced Philosophy of Sport (3) Critical examination of most rigorous and sophisticated essay pieces concerning metaphysical, epistemological, and axiological status of sport. Prereq: Consent of instructor.</td>
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<tr>
<td>5150</td>
<td>Systematic Philosophical Analyses of Sport (3) Critical examination of most comprehensive, systematic, and revealing accounts of metaphysical, epistemological, and axiological status of sport. Prereq: 5140 or consent of instructor.</td>
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<tr>
<td>5220</td>
<td>Readings in Physical Education (3) Comprehensive review of literature in physical education and related areas.</td>
</tr>
<tr>
<td>5230</td>
<td>Supervisory Problems in Physical Education (3) For students interested in supervision of physical education teachers.</td>
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<tr>
<td>5310</td>
<td>Analysis of Basic Motor Skills (3) Mechanical analysis of basic motor skills, emphasizing application of these skills to physical education and athletics.</td>
</tr>
<tr>
<td>5320</td>
<td>Seminar in Research Techniques in Physical Education (3) Examination of most rigorous and sophisticated essay pieces concerning metaphysical, epistemological, and axiological status of sport. Prereq: Consent of instructor.</td>
</tr>
<tr>
<td>5330</td>
<td>Psychology of Sport (3) Human behavior in sport context. Prereq: General psychology course and consent of instructor.</td>
</tr>
<tr>
<td>5340</td>
<td>Motor Behavior and Skill Acquisition (3) Application of research on human movement behavior to sport and physical education. Prereq: 4880 or consent of instructor.</td>
</tr>
<tr>
<td>5410-20-30</td>
<td>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.</td>
</tr>
<tr>
<td>5500</td>
<td>Advanced Kinesiology (3) Action of muscles involved in fundamental movements, calisthenics, sports, and gymnastics. Prereq: 3320 or equivalent.</td>
</tr>
<tr>
<td>5510</td>
<td>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.</td>
</tr>
<tr>
<td>5580</td>
<td>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. 1 lecture per week. (Same as Public Health 5580).</td>
</tr>
<tr>
<td>5600</td>
<td>Applied Physiology (6) Principles of physiology with special emphasis on application of physiologic findings to current health problems. Prereq: 1 yr general chemistry, or consent of instructor.</td>
</tr>
<tr>
<td>5610</td>
<td>Advanced Exercise Physiology (4) Principles of energy transformation, and behaviors with special emphasis on integration of organ systems in adapting to requirements of muscular exercise. Prereq: Zoology 4400 or equivalent, and consent of instructor.</td>
</tr>
</tbody>
</table>

**Division of Recreation**

**MAJOR**

<table>
<thead>
<tr>
<th>DEGREE</th>
<th>M.S.</th>
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</thead>
</table>

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

**Assistant Professors:**

The Recreation Division offers the following degree program:

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

### Course Descriptions

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>4130</td>
<td>Recreation Administration (3) Introduction to recreation administration, including planning, personnel, programs, and facilities.</td>
</tr>
<tr>
<td>4140</td>
<td>Survey of Recreation for Special Populations (3) Responsibility of recreation profession to minority groups whose leisure opportunities and needs may require special servicing. Prereq: 3140, 3200, 3880, or consent of instructor.</td>
</tr>
<tr>
<td>4500</td>
<td>Specialized Study in a Selected Area of Recreation (1-9) Comprehensive study in a selected specialized area within the broad field of recreation. Prereq: Recreation students only. Prereq: Consent of instructor.</td>
</tr>
</tbody>
</table>
instructor. May be repeated with consent of division. Maximum 9 hrs. E

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree 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; recreational 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

5240 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 Implementations 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

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 (1-9) Individual research on problem of special significance to student. Research projects of limited nature undertaken in lieu of thesis. May be repeated. Maximum 9 hrs. New problem must be undertaken for each repetition. E

5450 Specialized Study in Recreation (1-9) Advanced comprehensive study in selected specialized area within leisure and recreation field. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. E
College of Engineering

F. N. Peebles, Dean
W. K. Stair, Associate Dean
W. A. Miller, Associate 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-ELECTROWRITER

Since 1966, the College of Engineering has made use of electronic communication techniques to reach students beyond the confines of Knoxville classrooms. These remotely-taught classes make the specialized talents of engineering college faculty available to students at off-campus centers and industrial sites. This effort makes use of videotapes prepared from a regular on-campus class in specially-equipped classrooms. The tapes contain a visual and audible record of a professor's lecture and discussions with the on-campus classes and are played back at remote locations. Telephone/Electrowriter contact is established periodically between the professor and the off-campus class to allow full discussion and questions before or after a tape is played. Occasional visits by the professor are made to each remote class and students visit the Knoxville campus at selected times.

Graduate courses have been offered to students at other campuses and established centers of the UT System (Chattanooga, Kingsport, Martin, Nashville, and Tullahoma). A limited number of graduate courses have also been made available to engineers in industrial plants. Such courses are also offered to students using classroom facilities at Jackson State, Columbia State, and Walters State Community Colleges.

The remotely-taught courses offered by UT carry full graduate credit toward the Master's degree under authorization of the regional accrediting agency, the Southern Association of Colleges and Schools.

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 work at a Japanese university. The program requires approximately two years, one year being spent in Japan and the remaining period being spent at UTK to fulfill the course requirements and to write the thesis or project report, as appropriate to the particular department. The program is administered in the framework of each department's regular graduate program except that the research is done in Japan.

Although the language of communication in Japan would be English, cultural understanding is one of the important objectives of the program and as such a participant would be asked to begin Japanese language study. At the option of the department, up to 6 hours of graduate credit may be allowed for language study, either at UTK or in Japan.

Financial support for living expenses in Japan and for the round trip transportation can usually be arranged through fellowships from the Japanese Ministry of Education.

Engineering Experiment Station

F. N. Peebles, Director
W. K. Stair, Associate 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 exclusively to the company requesting the study. In such case, the whole expense will be carried by the parties requesting the investigation.

Engineering Administration

MAJOR
Engineering Administration

DEGREE
M.S.

Committee:
H. L. Loveless, Chairperson, J. F. Bailey,
F. A. Chambers, E. C. Huebschmann,

A program of study leading to the degree of Master of Science with a major in Engineering Administration is offered. This program is aimed at providing education for graduate engineers in the organization and direction of work in engineering functions, at a level which requires understanding of such areas as marketing, finance, and industrial relations. It should be emphasized that this is an engineering program aimed at preparing individuals for line management positions in construction, design, development, and manufacturing where both technical and nontechnical factors exert significant influence on the success of a given activity.

The program does not provide the opportunity for in-depth study of any of the traditional areas of business administration. Students with such interests are advised to consider graduate programs available in the College of Business Administration.

To be admitted to the Graduate School as a potential candidate for a Master's degree with a major in Engineering Administration, the applicant must submit reasonable evidence of ability to pursue graduate studies at an acceptable level of performance. In general, the applicant should have graduated from a recognized undergraduate institution in engineering with a satisfactory grade point average. In addition, applicants must satisfy one of the following experience requirements: (1) at least two years of engineering experience after graduation if a full-time student or (2) current employment in engineering work if a part-time student.
THE MASTER'S PROGRAM

Minimum requirements for the Master's degree are the satisfactory completion of the following coursework.

1. An Engineering Core, 27 hours of graduate credit consisting of Engineering Administration 5900, at least three courses chosen from Industrial Engineering 4150, 5110, 5120, and 5710, and a complement of engineering courses normally selected from the student's undergraduate major department or from courses of other departments pertinent to the program.

2. A Business Administration Core, 15 hours of graduate credit consisting of Accounting 5810, Finance 5650, Marketing 5500, Management 5130, and Transportation 5210.

3. General Electives, 9 hours of graduate credit chosen from computer science, economics, engineering, management science, mathematics, psychology, statistics, and other program-related disciplines.

The program requirement totals 51 hours of graduate course credit. No thesis is required. A final oral and written examination must be passed on the work offered for the degree.

Course prereqs for the program are Accounting 2110, Computer Science 3150, Industrial Engineering 4520, and Statistics 3450 or their equivalents. None of these prerequisites may be counted as part of the 51 hours of credit offered for the degree. These course prerequisites will be waived on presentation of evidence of competency in the course subjects. Other prerequisite courses may be required, depending upon the student's background and the electives chosen.

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 (3-15)
Study and formal report of engineering administration topic normally performed during last quarter of work toward degree. For M.S. in Engineering Administration only. May be repeated. Maximum 3 hrs credit to be applied toward degree. Must register for 5900 until project is complete. S/NC only. E

Departments of Instruction

Chemical, Metallurgical and Polymer Engineering

MAJORS

Chemical Engineering

M.S., Ph.D.

Metallurgical Engineering

M.S., Ph.D.

Polymer Engineering

M.S., Ph.D.

Professors:

H. F. Johnson (Head), D. Eng. Yale;

D. C. Bogus, Ph.D., Delaware; B. S. Borie;

Ph.D. Massachusetts Institute of Technology,

G. R. Brooks, Ph.D. Tennessee; E. S. Clark,

Ph.D. California; G. M. Morgan; B.S. Georgia (1969);

Ph.D. Cincinnati; O. L. Culberson, Ph.D. Texas;

J. F. Fellers, Ph.D. Akron; G. C. Frazier, Ph.D.

Ph.D. Tennessee; J. M. Hopkins, Ph.D. Tennessee;

H. W. Hau, Ph.D. Wisconsin; S. H. Jury

Emeritus; Ph.D. Tennessee; S. H. Jury (Emeritus),

Ph.D. Cincinnati; C. D. Lundin, Ph.D. Rensselaer

Ph.D. Pennsylvania; R. C. McCall; Ph.D. Kentucky;

C. F. Moore, Ph.D. Louisiana State;

B. F. Oliver, Ph.D. Pennsylvania State;

J. J. Perona, Ph.D. Northwestern; J. W. Prados, Ph.D. Tennessee; J. E. Sprawel, Ph.D. Pennsylvania; E. E. Stansbury; Ph.D. Cincinnati;

C. D. Thomas, Ph.D. Tennessee;

G. A. Vandersum, Ph.D. Illinois Institute of Technology; J. W. Watlow, Ph.D. Tennessee; J. L. White, Ph.D. Delaware; M. A. Wright; Ph.D. Wales.

Associate Professor:

W. T. Becker, Ph.D. Illinois.

Assistant Professors:

D. D. Bures, Ph.D. Houston; P. J. Meschter,

Ph.D. Pennsylvania.

Lecturers:

L. Dreher, Ph.D. Princeton; H. W. Hoffman,

D. Eng. Johns Hopkins; Ph.D. Michigan;

D. L. McElroy, Ph.D. Tennessee;

T. D. Parish, Ph.D. Rice; W. H. Seaton, Ph.D.

Ohio State; E. von Halle, Ph.D. Tennessee;

M. E. Whaley, Ph.D. Iowa State.

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, 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 5510.

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 evidence of ability to perform and report independent research to the satisfaction of the department. The Master's thesis may be offered as such evidence.

Department requirements consist essentially of the satisfactory completion of:

1. Graduate courses in chemical engineering, metallurgical engineering, or polymer engineering amounting to approximately 36 quarter hours, at least 12 of which must be in 6000 series courses. The polymer engineering major must include Polymer Engineering 5110, 5210, 5230, 5310, 5410, 5510, 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 preliminary examination, usually given in two parts, and covering such materials as chemical, metallurgical, and polymer engineering, is intended to test the student's understanding of his choice of field, to determine the student's background and the electives chosen.

4. Active participation in graduate seminars conducted by the department. Resident students must register for the appropriate 5050 every quarter offered.

5. Reading knowledge of a foreign language relevant to the student's specialization program, or a demonstration of ability to perform a research program; selection of language to be made in consultation with the faculty committee. Appropriate languages are French, German, Italian, Japanese, Russian.

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 emphasis in chemistry and engineering, 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, completion of Polymer Engineering 4520, 5510, 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 4520, 5510, 5410, and either 5230 or 5210 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 exchangers; 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: 3440. 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 and transfer functions. Mathematical models for several processes are developed and analyzed in detail. Prereq: Mathematics 2840.

3620 Chemical Process Control (3) Basic control
magnetic properties of materials by specification of magnetic properties of materials; re-

3710 Metallurgical Engineering 3420. (Same as Engineering 3350 or consent of instructor.) Also

3270 Diffusion and Annealing (3) Diffusion and laboratory work. Prereq: Mathematics 4610.

5310 Solidification and Crystal Growth I (3) Solute redistribution, thermodynamic considerations, kinetic, convection and fluid flow effects on the solid to liquid transition. Prereq: Mathematics 4550.

510-20 Advanced X-Ray Diffraction (3, 3) Review of mathematical techniques; generalized dif-

450-20 Advanced X-Ray Diffraction (3, 3) Review of mathematical techniques; generalized dif-

450-20 Radiation Effects on Materials (3, 3) Introduction to radiation effects on materials, in-

5610-20 Radiation Effects on Materials (3, 3) Introduction to radiation effects on materials, in-

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.

5130 Plastic Deformation 11 (3) Plastic deformation and twinning; work hardening; effects of tempera-

5120 Plastic Deformation 1 (3) Geometry and mechanical theories of plastic deformation of single crystals; slip and twinning; work hardening; effects of temperature and alloying on short-term loading. Prereq: 5110.

5140 Diffusion and Annealing in Solids (3) Analysis of models and experimental observations relating to phenomenological and mechanistic description of diffusion and annealing of point defects and cold work.

5150 Phase Transformations I (3) Analysis of models and experimental observations relating to phase transformations by nucleation and growth; solidification, precipitation, and crystallographic techniques. Prereq: 5140.


5210-30 Welding Metallurgy (3, 3, 3) Welding processes and physical metallurgy of welding, in-

5610-20 Radiation Effects on Materials (3, 3) Application of thermodynamic and physicochemical methods to metals and metallurgical reactions. Related to the theory and experiment to structure of liquid and solid solutions, and to alloy systems.

5700 Doctoral Research and Dissertation (1-15) E

6100 Mechanical Metallurgy I (3) Ductile and brittle fracture, creep, stress rupture, fatigue, and re-

640-20 Thermodynamics of Solids (3, 3) Classical and statistical thermodynamic analysis of stability of solid solutions, solids in water, and ordered phases.

6510-20-30 Metallurgical Thermodynamics (3, 3, 3) Application of thermodynamic and physicochemical methods to metals and metallurgical reactions. Related to the theory and experiment to structure of liquid and solid solutions, and to alloy systems.

6610-20-30 Metallurgical Thermodynamics (3, 3, 3) Application of thermodynamic and physicochemical methods to metals and metallurgical reactions. Related to the theory and experiment to structure of liquid and solid solutions, and to alloy systems.

6810 Mechanical and Physical Properties of Cryst-

6820 Mechanical and Physical Properties of Crystals (3) Stress and strain; elastic constants; anisotropic behavior of crystalline materials. Prereq: 6810 or 6820, or consent of instructor.

6900 Mechanical and Physical Properties of Crystals (3) Stress and strain; elastic constants; anisotropic behavior of crystalline materials. Prereq: 6810 or 6820, or consent of instructor.

6700 Seminar in Anisotropic Properties of Crystals (3) Selected topics of current research. Not for credit for Polymer Engineering majors.

6920 Polymer Processing (3) Rheological properties; morphology of polymers; theories of cra-

6910 Applied Polymer Science (3) First course in the physical properties of polymers. Polymer struct-

6900 Mechanical and Physical Properties of Crystals (3) Stress and strain; elastic constants; anisotropic behavior of crystalline materials. Prereq: 6810 or 6820, or consent of instructor.

6830 Seminar in Anisotropic Properties of Crystals (3) Selected topics of current research. Not for credit for Polymer Engineering majors.

6910 Applied Polymer Science (3) First course in the physical properties of polymers. Polymer struct-

6920 Polymer Processing (3) Rheological properties; morphology of polymers; theories of cra-

450-20-20 X-Ray Diffraction and Crystallography (3, 3) Lecture and laboratory work in crystallography, crystal structures, phase relationships, crystal structures, phase transformations, and inorganic crystal structures. The first quarter serves as an introduction to the subject. 2 hrs and 1 lab.

4540 Fracture-Safe Design (3) (Same as Engineer-

3140 Engineering Materials IV (3) Extension of 2110 or 3110 with emphasis on materials processing, specification and evaluation. Suggested for me-

3150 Engineering Materials V (3) Extension of 2110 with emphasis on metals and control of reactions of engineering materials with aqueous, nonaqueous, and gaseous environment. Prereq: 3110 or consent of instructor.

3160 Engineering Materials VI (3) Extension of 2110 or 3110 with emphasis on materials of significance in nuclear engineering; nuclear reactor construc-

3700 Metallurgical Applications in Manufacturing Technology (3) Fabrication methods and principles of mechanical/thermal processing for finished and semi-finished articles; casting, powder metallurgy, plastic forming, joining, heat treatment. Prereq: 2110 or equivalent.

4240 Engineering Materials Design (3) Property considerations for selection of materials and for heat treatment, welding, and transformation in ferrous alloys. Plain carbon steels, simple and complex alloys. Current theories of cold working, deformation, fracture, precipitation, and phase transformations are discussed. Special attention is given to plastic deformation, fracture, precipitation, and phase transformations. Prereq: 4510-20.

...
5000 Thesis (1-15) E
5110 Structural Characterization of Polymers (3)
5210 Mechanics of Polymer Fluids and Solids (3)
5230 Mechanical Behavior of Solid Polymers (3)
5310 Polymer Solution Properties and Characterization (3)
5410 Rheology and Polymer Processing (3)
5510 Modern Research Tools and Instruments for Polymer Science (3)
6110 Optical Properties of Polymers (3)
civil engineering or environmental engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study to ensure that it includes the necessary design content. The thesis and non-thesis options noted under the Master of Science programs are available under these programs.

THE DOCTORAL PROGRAM

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

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

1. A minimum of 108 quarter hours credit beyond the Bachelor's degree, exclusive of credit for the M.S. thesis. Of this number, a minimum of 36 quarter hours credit in Doctoral Research and Dissertation will be required.

2. A minimum of 36 quarter hours of graduate courses in the Civil Engineering Department, exclusive of thesis or dissertation credit, at least 9 hours of which must be at the 5000-level.

3. Supporting courses in related scientific and engineering fields, amounting to approximately 36 quarter hours, subject to approval by the student's faculty committee. These related fields will normally include such disciplines as mechanics, chemistry, mathematics, microbiology, physics, and other engineering fields. A minimum of 12 quarter hours of mathematics will be required beyond the civil engineering undergraduate requirements.

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

5. Upon completion of at least one-half of all course work, each student must pass a preliminary examination.

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

Civil Engineering

4120 Concrete Design (3) Reinforced concrete continuous beams and floor slabs; footings, and retaining walls. Prereq: 4110 and 4410. Sp

4220 Foundations and Substructures (3) Foundations: principles of design and substructure; footings and earth structures. Prereq: 3310. Su

4230 Legal and Ethical Aspects of Engineering (3) Legal principles underlying professional engineering; laws of contracts, torts, agency, real property; problems of professional registration and ethics. F

4240 Structural Design (3) Plastic theory, eccentric connections, industrial building design, timber design. Prereq: 3230 and 4410. 2-3 hr periods. F, Sp

4250 Photogrammetry (3) Methods of plotting maps by the photographing and processing of aerial photographs. A\n
4271 Portland Cement Concrete Mix Design (3) Properties and tests of portland cement concrete, methods of concrete mix design, nondestructive concrete evaluation testing, use of concrete admixtures. Prereq: 3710. 2 hrs and 1 lab. F

4272 Asphalt and Bituminous Concrete (3) Properties and tests of asphalts and asphaltic mixes, mix design of bituminous concrete. Emphasis on use of asphalt in transportation construction projects. Prereq: 3710. 2 hrs and 1 lab. W

4711-12-13 Earthquake Resistant Structures I, II, (4, 4, 4) (Same as Architecture 4711-12-13) Su

4850 Elementary Structural Matrix Methods (4) (Same as Architecture 4850 and Architecture 4850) Su

5000 Thesis (1-15) E

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

5110-20 Statically Indeterminate Structures (3, 3) Deflections of beams and trusses: analysis by force methods and by slope-deflection in 5110; analysis by moment distribution and other displacement methods, section deflections, and continuity. F

5140 Statically Indeterminate Structures (3) Analysis of complex planar and space frames. Prereq: 5110 and 5120. Sp

5150 Matrix Formulation of Structural Problems (3) Review of matrix algebra, vectors, stability considerations; stiffness and flexibility analysis of planar trusses, general members and structures composed of general members. Prereq: 4540 or consent of instructor. F

5160 Analysis and Design of Plate Structures (3) Bending and buckling of plates; analysis and design of bridge and building floors and structural plate components. Prereq: 5110. F

5170 Introduction to Structural Dynamics (3) Analysis of structural vibrations, correlation with dynamic response of structures having many degrees of freedom; elastoplastic behavior considered for structural systems; approximate design methods developed. Prereq: 5120, 5150. Sp

5180 Finite Element Structural Analysis (3) Application of finite element method to structural analysis; plane stress, plane strain, axisymmetric, and three-dimensional elements; use of typical computer programs, Prereq: 5150, and Engineering Science and Mechanics 5860; Engineering Science and Mechanics 5810.) Sp, A

5220 Pavement Design (3) Pavement loads; pavement design; design practices; construction and maintenance. Prereq: 3310. Sp

5240 Advanced Properties of Materials: Cement and Concrete (3) Permeability and durability; volume changes and creep; elastic and thermal properties of concrete; special types of concrete; causes of failure. Prereq: 4710. W

5259 Advanced Properties of Materials: Bituminous Substances and Mixes (3) Serviceability concepts; pavement failures and remedies; bituminous pavement maintenance; other uses of asphalt products. Prereq: 4720. W

5270 Planning and Transportation (3) Preparation of transportation and elements of comprehensive development plans, planning for purpose of site selection and design of an airport facility through a comprehensive team project, includes environmental evaluation of design. Prereq: 4620. 1 hr and 2 labs. Su

5410-42-43 Traffic Engineering I, II, III (3, 3, 3) Traffic engineering; organization, finance, personnel administration; planning of governmental and industrial projects; cost estimates and methods of financing. Prereq: 5220. W

5420 Structural Model Analysis (3) Experimental methods of shear, moment, and stress analysis.

5430-40-50 Construction Management I, II, III (3, 3, 3) Organization and management of heavy and building construction projects. Prereq: 4430 or consent of instructor. F; W

5450-60 Construction Estimating I, II (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

5550 Soil Mechanics—Plastic Equilibrium (3) Failure theories; earth pressure analysis, bearing capacity analysis, and slope stability analysis. Prereq: 3310 or consent of instructor. F

5560 Soil Mechanics—Slope Stability (3) Slope deformation characteristics, consolidation, settlement analysis. Prereq: 3310 or consent of instructor. W

5570 Soil Mechanics—Seepage (3) Saturated flow through embankments, filter design criteria, seepage forces and velocities, subdrains, and embankment failures. Prereq: 3310 or consent of instructor. Sp

5610 Behavior of Steel Structures (3) Behavior of structural steel members due to static and fatigue loading; relation between research results and current specialization for design. Prereq: 3320. W

5730 Prestressed Concrete (3) Properties of prestressing materials and anchorage systems; methods of prestressing and posttensioning; analysis and design of members and continuous structures. F

5740 Behavior of Reinforced Concrete Members (3) Ultimate strength and behavior of reinforced concrete members; relation between research results and current specifications for design. Prereq: 4560. F

5800 Urban Systems: Engineering and Management I (3) Management of various urban systems including terminal layout and design and ground access systems and parking. Prereq: 3600 and 3610. Sp
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 systems, including lighting, parking, cleaning and snow removal, water supply and wastewater drainage, solid waste, air pollution and the atmospheric environment. Prereq: 5800. Sp, A
5810 Traffic Engineering—Characteristics (3) Driver-vehicle-roadway system; level-of-service concept of capacity. Coreq: Statistics 3450. 2 hrs and 1 2-hr lab. W
5820 Traffic Engineering—Operations (3) Fixed-time and volume-density controllers; progressive systems; one-way operations; reversible flows; system operation, including computerized networks; legal aspects of operational controls. Prereq: 5810. 2 hrs and 1 2-hr lab. W
5840 Geometric Design (3) Advanced theory and planning of 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. Analysis of the relationship of the provision of parking and transportation facilities in urban centers, including the nature of transportation systems; design features, including cross sections, intersections, utility considerations, parking, effect of design on traffic volume and channelization; lighting; freeway, frontage road, surface street system. Prereq: Consent of instructor. Su
5860 Urban Transportation Planning (3) Prediction of traffic demands and vehicular flows; land use planning; parking needs. Prereq: 5810. F
5870 Public Transit Planning (3) Person movement by bus, rapid rail and taxicab transit. Nature of public transit systems, its various roles and how it 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, F
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 (1-9) To fulfill the special problem requirement in the non-thesis program. Enrollment limited to civil engineering students. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/NC only. E
5910-20-30 Special Topics (3, 3, 3) Analysis and design of water resources structures, construction, materials and computer science techniques in modeling of hydrologic systems; design of irrigation systems; solid waste disposal; air pollution control; traffic flow, urban drainage, etc. Prereq: 5261 or consent of instructor. F
6000 Doctoral Research and Dissertation (3-15) E
6110 Behavior of Steel Bridges and Buildings (3) Behavior, analysis, and design of plate girders, columns and composite members subjected to static and dynamic loading. Prereq: 5170 and 5610. Sp, A
6740 Behavior of Reinforced Concrete Beams and Frames (3) Ultimate strength and behavior of statically indeterminate reinforced concrete structures; applicability of elastic analysis to framed structures; limit analysis. Prereq: 5120 and 5740. Sp, A
6830 Traffic Flow Theory (3) Queuing theory, Markov processes, Markovianization and simplification of various conditions and/or designs. Prereq: 4540 or Mathematics 3150; 5820.
6880 Statewide Passenger Transportation Planning (3) Nature and evolution of transportation systems and planning, 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 new technology and planning process and possible research designs. Prereq: 5670. Sp, A
6880 Planning Models for Transportation System I (3) Analysis of mathematical, statistical, and computer science techniques. Modal split, trip distribution, and trip assignment. Mathematical, statistical, and computer science techniques in modeling process. Models integrated for urban transportation planning process. Prereq: 6880. 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.
Environmental Engineering
3000 Introduction to Environmental Engineering (3) Introduction to human interaction with the air, water, and land environment in which one lives; role of engineering in environmental control. F, W
4030 Environmental Engineering Chemistry (3) Fundamentals of chemistry related to generation, formation, and removal of environmental contaminants. Analytical techniques for evaluation of specific air, water, and waste contaminants. Prereq: 3000 and Chemistry 1110. F
4150 Urban Water Management (3) Introduction to urban water modeling; evaluation of optimum urban water policy; formulation of system control strategies and analysis of decision-making process; management of storm water for beneficial use. Prereq: 3000 and 3330. Sp
4210 Water Resources Engineering Design (3) Elements of water resource structures and systems, including reservoirs, dams, control works, and open channel design. Dam safety control, environmental impact of reservoir projects. Prereq: 3330 or consent of instructor. F
4220 Water Resources Engineering Development (3) Multibjective evaluation procedures for comparing and selecting among water resources development alternatives; achieving project optimality, single- and multi-purpose projects, special topics in water resources engineering. Prereq: 3330 or consent of instructor. W
4330 Hydrologic Design (3) Application of frequency and regression analysis to hydrologic design of water systems; computer surface runoff and streamflow modeling; urban peak runoff design using kinematic wave theory; evaluation of effects of land use on streamflow and quality. Prereq: 3330. W
4510 Elements of Water and Wastewater Transportation Systems (3) Introduction to theory and design of water transportation and distribution systems and wastewater collection systems. Prereq: 3120 and 3330. F, W
4530 Sanitary Engineering Laboratory (3) Physical, chemical, and bacteriological analysis of water and wastewater. Prereq: 4030. 3 labs. W
4600 Solid Waste Management (3) Quantities and characteristics of solid wastes; collection methods and equipment; equipment and processes for solid waste treatment technologies; economics, planning and management. Prereq: 3000. Sp
4700 Air Pollution-Air Resources Management (3) Introductory course on concepts of air pollution, analysis of relationship among emission sources, meteorology and topographic factors, and adverse effects on receptors; engineering approaches for air pollution control. Sp
4810 Water Law (3) Survey study in water law, including case studies and water law doctrines. (Same as Water Resources Development 4810.)
4820 Environmental Engineering Law (3) Legal aspects of water and air pollution, drainage, land use controls and environmental impact statements with emphasis upon federal-state relations, recent legislation and court decisions, and enforcement. Prereq: Senior standing. F
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. Prereq: May be repeated. S/NC only. E
5150 Water and Urban Welfare (3) Social, environmental, and economic impact on planning and management of urban water systems. Emphasis upon the effects of water resources upon environmental and development values, measurement of social well-being and quality of life parameters. Analyzing and synthesizing connections between urban and environmental development and urban planning, and problems of utility service policies. Prereq: 5160 and 5180. Water Resources Development 5160.
5323 Sediment Transportation (3) Sediment properties and measurements, bed loads and suspended load movement, erosion and deposition of sediments by flowing water; settling of reservoirs and related topics. Prereq: 5230. W
5234 Flood Damage Reduction (3) National, regional, local flood problems; hydrologic design criteria; traditional flood control measures; land use controls and adjustments; floodproofing, flood insurance, and other flood damage reduction elements; interdisciplinary approach in floodplain management, case studies. Prereq: Consent of instructor. F
5261 Basic Principles of Remote Sensing (3) Applications of remote sensing in agriculture, engineering, forestry, meteorology, land use planning, and resource management. Information development, and computer science techniques in modeling of hydrologic systems; design of irrigation systems; solid waste disposal; air pollution control; traffic flow, urban drainage, etc. Prereq: 5261 or consent of instructor. F
5262 Remote Sensing Data Acquisition (3) Active and passive sensors, their areas of special application and limitation; description of remote sensing platforms, including the Earth Resources Satellite Communication Systems; mission planning. Prereq: Consent of instructor. F
5301 Stormwater Modeling I (3) Interpretation of hydrologic data using methods of systems analysis. Hydrologic components are analyzed as linear and nonlinear systems with emphasis on their influence on storm runoff, and models of watershed response. Optimizing model parameters with illustrative examples. Prereq: Consent of instructor. F
5302 Stormwater Modeling II (3) Continuous
5620 Solid Waste Collection Systems (3) Analysis and design of solid waste systems; classification, crew size, routing of vehicles, efficiency of col-

5700 Planning and Air Pollution Control (3) Rela-
tionship between air pollution, area development, and urban 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 monitoring, dispersion concepts. Prereq: 5720 and Engineering
Science and Mechanics 3110. F

5720 Air Pollution Particle Collection Theory (3) Mechanics of particles suspended in gaseous media including particle motion, coagulation, and aerodynamic capture of particles. Prereq: 4700 and 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 emissions of gaseous and particulate pollutants. Combinations of passive and active re-
ductive design of specific devices and systems. Prereq: 5720. Sp.

5735 Industrial Source Sampling (3) Sampling methods and air pollution emissions from industrial processes. Prereq: Graduate standing. 2 hrs and 1 lab. Su

5740 Dynamical and Physical Meteorology (3) Physics of the atmosphere. Atmospheric energetics, general circulation, per-
turbation theory, vorticity theory, the equation of motion, radiation, heat, thermodynamics of dry and moist air. Prereq: Mathem-
atics 4560 and Engineering Science and Me-
chanics 3110.

5750 Turbulence in the Atmosphere (3) Theoretical and experimental study of turbulence in the atmosphere. Prereq: 5740.

5760 Diffusion in the Atmosphere (3) Movement and dilution of natural or man-made material released into the atmosphere. Rise of buoyant plumes, relation between Eulerian and Lagrangian scalars, differences between instantaneous and continuous sources, diffusion in a zone of wind shear and diffusion from urban areas. Prereq: 5740.

5900 Special Problems in Environmental Engineering (1-9) To fulfill the special problem requirement in the non-thesis program. Enrollment limited to environ-
mental engineering students in the non-thesis program. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. S/C only. E

5910-20-30 Special Topics (3, 3, 3) Problems and topics related to current developments in field of environmental engineering not included in other courses. E

5990 Environmental Engineering Seminar (1) Selected advanced problems in environmental engineering. Prereq: Consent of instructor. E

NOTE: Prerequisite to all graduate courses: Consent of instructor.

College of Engineering

Electrical Engineering

MAJOR

DEGREES

Electrical Engineering

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

Professors:
J. M. Gough (Head), Ph.D. Georgia Institute of Technology; P. Z. Peebles, Ph.D. Pennsylvania State; J. C. Hung, Ph.D. Tennessee, P.E.; J. M. Gouge (Head), Ph.D. Georgia Institute of Technology; A. O. Bishop, Ph.D. Massachusetts Institute of Technology; R. E. Bodenheimer, Ph.D. Northwestern; R. C. Gonzalez, Ph.D. Florida; W. L. Green, Ph.D. Texas A&M; W. B. White, Ph.D. Virginia; J. F. Pierce (Head), Ph.D. Georgia Institute of Technology; P. Z. Peebles, Ph.D. Pennsylvania; J. F. Pierce (Head), Ph.D. Georgia Institute of Technology; R. W. Rochelle, Ph.D. Maryland; J. R. Roth, Ph.D. Cornell; B. Smith, M.S. Illinois; R. E. Bodenheimer, Ph.D. Northwestern; J. D. Tillman, Ph.D. Auburn; C. H. Weaver, Ph.D. Wisconsin, P.E.

Assistant Professors:

Assistant Professors:
J. D. Birdwell, Ph.D. Massachusetts Institute of Technology; J. S. Lawler, Ph.D. Michigan State.

MASTER OF SCIENCE PROGRAM

Graduate work leading to the Master of Science degree in Electrical Engineering may be completed by either a full-time program of full-time study, or the degree may be obtained in two or three years of study in the evening. Graduate assistantships are available for outstanding students, who may obtain the Master's degree in one calendar year.

Specific departmental requirements include:

1. Electrical Engineering 5070-80 and 5710. Electrical Engineering 5710 is normally available in both fall and spring quarters. Students electing courses such as 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
DOCTORAL PROGRAM

A graduate program leading to the Master of Engineering degree is available to qualified graduates of ECEP-credited undergraduate curricula in electrical engineering or its equivalent. Specific degree requirements which must be fulfilled include:

1. Electrical Engineering 5070-80 and 5710.
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. A final oral examination covering the thesis and related course work.

MASTER OF ENGINEERING PROGRAM

A graduate program leading to the Master of Engineering degree is available to qualified graduates of ECPD-accredited undergraduate curricula in electrical engineering or its equivalent. Specific degree requirements which must be fulfilled include:

1. Electrical Engineering 5070-80 and 5710.
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. Master's thesis, totaling 9 quarter hours or more.
5. A final oral examination covering the thesis and related course work.

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.

DOCTORAL PROGRAM

The Ph.D. degree with a major in Electrical Engineering may be pursued in the areas of circuit theory, computer, electronics, optics, communication systems, quantum theory, plasma engineering, power systems, power electronics, and control systems. Specific degree requirements 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 credit in doctoral dissertation.
4. One foreign language if the student's faculty committee deems necessary, knowledge of a foreign language is crucial to the student's research efforts.

5. Satisfactory performance on both a basic and an advanced preliminary examination consisting of a 3-hour written examination in each of the following five areas: (1) networks, (2) electronics, (3) electro-magnetics, (4) power, (5) systems and computers. The advanced examination must be completed before the student's doctoral committee before the student is reported as ready for admission to candidacy for the Ph.D. degree. The basic examination must be passed and a formal 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. The basic examination is normally taken after the completion of 36 hours of graduate course work. A minimum of 72 quarter hours of course work must be completed after the student has taken the basic part of the preliminary examination the first time.

6. Participation in department seminars.

The 72 quarter hours of course work must satisfy the following requirements:

a. A minimum of 36 quarter hours of work in electrical engineering at the 5000 and 6000 levels.

b. A minimum of 12 quarter hours of 6000-level course work. At least 3 quarter hours of this must be in an area other than the student's major area.

c. A minimum of 6 quarter hours of mathematics, including Mathematics (or Physics) 5610-20-30 and 9 hours of mathematics at the 4000 level or above.

Courses required in electrical engineering undergraduate courses cannot be used in either the M.S. or Ph.D. programs. In addition, 4000-level courses in electrical engineering may not be used if 5000-level courses are available in the same area.

Many of the advanced engineering courses are offered in the evening. Engineers working in industry are encouraged to participate in the department's graduate program.

Departmental graduate programs providing special opportunities for academic and research work in areas pertinent to atmospheric and space flight are also available at the Space Institute, Tullahoma.


3040 Basic Communication Systems (3) Fourier series and transforms. Network response to signals and noise. Elements of amplitude, frequency and phase modulation systems for analog messages and digital. Prereq: 3060. 3 hrs including project laboratory.

3060 Propagation I (3) Plane waves, reflection, guided waves, transmission lines, standing waves, impedance, standing wave ratio, reflections and refractions, and field strength. Prereq: 3050. 3 hrs including biweekly lab.

3080 Energy Conversion (3) Magnetic circuits, transformer theory. Theory of electromagnetic energy conversion with emphasis on input-output characteristics; steady-state analysis of induction and direct current machines. Prereq: 3040. Includes biweekly lab.

3090 Energy System Operation (3) Synchronous machines, transmission-line, and transformers as power system elements; power system representations, per unit calculation, symmetrical components, and fault studies. Prereq: 3080 includes biweekly lab.


3110 Basic Electrical Engineering—Circuits and Fields (3) For non-electrical engineering majors. Prereq: Mathematics 2850. Physics 2310-30. 3 hrs including biweekly lab.

3120 Basic Electrical Engineering—Electronics (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including biweekly lab.

3130 Basic Electrical Engineering—Mechanics (3) For non-electrical engineering majors. Prereq: 3110. 3 hrs including biweekly lab.


3190 Plasma I (3) Engineering applications of physical electronics, plasma effects and devices. Topics include plasma production, stability, 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 biweekly lab.

3720 Digital Systems Analysis (3) Steady-state and transient response; log-frequency, gain-phase, and polar plots; block diagram transformation; signal flow graphs; analogous systems, properties of second order systems; introduction to feedback theory; stability criteria. Prereq: 3010 and Mathematics 3150. Coreq: 3180. 3 hrs including occasional labs.

3810 Basic Electronics I (3) Band theory fundamentals; theory and applications of pn junctions; simple power supplies; theory of operation of field-effect transistors and amplifiers in simple circuits. Coreq: 3290. 3 hrs including project laboratory.

3820 Basic Electronics II (3) Physical operation of bipolar transistors and vacuum tubes with applications in basic amplifiers. Integrated circuit fundamentals. Prereq: 3810. 3 hrs including project laboratory.


4020 Direct Electrical Energy Conversion (3) Basic principles, devices and applications for the conversion of electrical energy to mechanical, hydraulic, and thermal energy. Laboratory demonstrations. Prereq: 3050, 3190 and 3810.

4080 Microwave Circuits and Electronics (3) Circuits represented by wave scattering, isolators, gyrotrons, circulators, microwave vacuum diodes and klystrons, crossed field devices, parametric amplifiers, power generator semiconductors, varactors, and semiconductors. Prereq: 3060. 3 hrs including biweekly lab.

4090 Propagation II (3) Metal tube, dielectric rod, and stripline waveguides. Waveguide resonators and other loading techniques. Design of slot structures utilized for microwave power transmission and for microwave integrated circuits. Prereq: 3060. 4 labs.

4100 Digital Communication Systems (3) Principles of pulse modulation and digital communication systems. Sampling theorems, pulse amplitude, duration, and posi-

Introduction to Feedback System Design (3) Mathematical formulation of control systems; steady state error and error constants; root-locus methods; gain adjustments; compensation networks; introduction to compensation. Prereq: 3720. Lab optional.

Power System Components and Control (3) Analysis of power system components and their interconnection. Studies in control of power and frequency as well as voltage and reactive power. Prereq: 3590.

Power Systems Analysis (3) System studies including load flow, faults, and stability. Prereq: 3900.

Transmission, Distribution, and Protection (3) Studies in underground and d.c. transmission; consideration of over-voltages and insulation requirements; system protection against faults. Prereq: 3900.

Lasers and Masers (3) Introduction of principles of optical masers based on classical concepts and electrical engineering analogies. Consideration of practical devices and applications.

Plasma II (3) Magnetohydrodynamics. Prereq: 3190.

Plasma III (3) Macroscopic plasma equations, particle orbits, interactions, oscillations and waves. Prereq: 3190.


Electro-optics Detection and Instrumentation (3) Sensitivity, resolution (frequency response) and noise concepts of and practical engineering data for both spatial recording media (e.g. photographic emulsions) and temporal detectors (e.g. photo-diodes) will be given. The last third of the course will be devoted to selected electro-optic instrumentation systems (e.g. laser light scattering, optical data processing, holographic interferometry).

Antennas and Propagation (3) Dipole and linear antennas, arrays and other simple antennas. Antenna gain, impedance and other parameters. Wave propagation in free space, earth's troposphere and ionosphere. Wave reflections from earth.

Electro-Acoustics (3) Reproduction of monaural and stereophonic sound. Microphones, loud speakers, disc recording, magnetic recording, film recording; acoustics of studios, audiontumms and utilized. Telecommunications are developed.

Audio-Visual Communications (3) Receiver and transmitter circuits for communications. Prereq: 3940, 3830. 3 hrs including project laboratory.


Electromechanical Components of Control Systems (3) Characteristics and analysis of electromechanical devices used in control systems. Prereq: 3720. 3 hrs including project laboratory.


Electromechanical systems. Applications in industrial process control. Prereq: 3080 and 3720.

Hardware-Software Interface in Minicomputer and Microprocessor System Design (3) Presents minicomputer and microprocessor interfacing, interfacing, hardware-software interaction and trade-off. Priority interrupt software is discussed and utilized. Telecommunications are developed. Project oriented, contract completion. Course completion of two projects, one utilizing a minicomputer and the other a microprocessor. Prereq: 3310. 3 hrs including course requirements. Prereq: 3180.

Discrete-Data Systems (3) Introduction to analysis and design of digital systems using modern techniques. Real-time digital filtering techniques; application of digital computers in closed-loop feedback systems.

Introduction to Pattern Recognition (3) Role of pattern recognition within framework of artificial intelligence. Topics dealing with the design of learning and adaptive machines. Typical applications of pattern recognition to problems of practical significance. Computer simulation of elementary pattern recognition problems. Prereq: Either 3160 and 3720, or Consent of Instructor. Lab. 3 hrs including Project Laboratory.

Digital Image Processing (3) Principal methods for coding, storing, and processing images by means of digital computers. Computational algorithms for image operations. Prereq: 3100 and Consent of instructor. 3 hrs including Project Laboratory.

Small Computer Systems (3) Basic structure and operation of small computer systems. Input-output techniques, interrupt structures, peripheral devices, system software and assembly language programming. Course is project oriented. Prereq: Basic Engineer 1410, Computer Science 1510 or 3150 or consent of instructor. (Same as Computer Science 4850.)

Special Electrical Engineering Problems (3) Problems in electrical engineering involving library research and experimental research.

Modern Systems Theory 1 (3) Introduction to modern systems theory. State-space model, linear dynamical model, state space transition map, matrix exponential, controllability, observability, dynamical systems theory. Prereq: consent of instructor. 3 hrs.


Modern Systems Theory 3 (3) Optimal control theory. Deterministic optimal control theory, minimax principles, intelligent control, and dynamic programming, stochastic control theory,
5410 Advanced Direct Electrical Energy Conversion (3) Theory, latest devices, and applications for power generation and conversion. Emphasis on transformer construction, insulation, and cooling. Prereq: 4020 or Mechanical Engineering 4150 or equivalent, or consent of instructor.


6500-10 Electrical Conduction in Gases and Plasma Physics (3, 3) (Same as Physics 6500-10).


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, 3, 3) Selected advanced topics in electronic instrumentation based on particular interests of students. Fundamental physical processes in instrumentation transducers including thermoelectric, magneto- and piezoelectric, electronic devices and their application in signal processors. Resolution, sensitivity, response time, and cross coupling in signal processors. Prereq: 5000-30 or consent of instructor.


Engineering Science and Mechanics

MAJOR Engineering Science M.S., Ph.D.

Professors: W. Snyder, (Head), Ph.D. Northwestern; J. E. Akiva, Ph.D. Virginia Polytechnic Institute, P.E.; T. G. Carley, Ph.D. Illinois, P.E.; A. N. Ertsland, Ph.D. Illinois, P.E.; J. P. Forrester; Ph.D. Illinois State; P.E.; C. W. Lee, Ph.D. Illinois Institute of Technology; W. A. Miller, Ph.D. Georgia Institute of Technology; W. F. Pease, Ph.D. Tennessee; P.E.; H. Pin, Ph.D. Illinois Institute of Technology; C. J. Remenyi, Ph.D. Johns Hopkins; C. D. Scott.

Ph.D. Tennessee: L. R. Shobe, M.S. Kansas State (Emporia); P.E.; D. G. Thomas, Ph.D. Ohio State, P.E.


Graduate programs leading to the degree of Master of Science and Doctor of Philosophy with a major in Engineering Science are available to graduates of recognized quality in the following areas: mathematics, or one of the physical or biological sciences. Program options include solid mechanics, fluid mechanics and biomedical engineering. In the biomedical and engineering sciences, optional interdisciplinary programs are arranged to meet individual needs or interests. Each applicant will be advised as to any prerequisite courses before entering a program; the student's program of study must be approved by his/her advisory committee, and must comply with the requirements of the Graduate School. The student must be selected from a department other than the Department of Engineering Science and Mechanics. A departmental admission is required in addition to the Graduate School admission. 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) tie at one of the interfaces between science and engineering, or can best be met by interdisciplinary study in engineering. The department's course offerings and research activities are also intended to meet the needs of students who seek an education 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 48 hours is required. The requirements include the following:

Mathematics 18

Engineering courses 27

(Major option; may include

*Engineering courses under Plan II may include advanced laboratory work or special project work for example Engineering Science and Mechanics 5910 or analogous courses under different department headings.

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 appropriate to engineering courses.)

Thesis 9

A final examination is required under both plans, covering graduate course work and the thesis (if any).

THE DOCTORAL PROGRAM

General policies and requirements of the Graduate School relating to admission, residence, languages, research, examinations, faculty advisory committee, and admission to candidacy apply to this program.

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

1. A minimum of 108 quarter hours credit beyond the Baccalaureate, 60 of which must be credit for the Master's thesis. These shall include a minimum of 36 quarter hours credit in Doctoral Research and Dissertation and a minimum of 72 quarter hours credit in other courses.

2. A minimum of 36 quarter hours in engineering graduate courses, exclusive of thesis and dissertation credit. These courses will normally be numbered 5000 and above, with at least 12 of these hours of 6000-level courses, which constitute one or two areas of concentration selected by the student. The number of courses in this group to be taken will depend on the program selected by the student and the approval of his/her advisory committee.

3. A minimum of 18 quarter hours in mathematics or computer science in courses numbered 4000 and above, exclusive of a first course in ordinary differential equations.

4. A minimum of 9 quarter hours of courses numbered 5000 and above, offered in departments other than mathematics, computer science, and the student's major department and not included in the areas of concentration under item 2.

5. Active participation in graduate seminars and colloquia.

6. Preliminary examination consisting of a written qualifying examination and an advanced examination. The qualifying examination covers areas of engineering science and mathematics, for the most part at a level and scope expected of well-qualified recipients of a Bachelor's degree in engineering. The advanced examination requires demonstration of special competence in the areas of concentration selected by each student. Prerequisites: 

7. Submission of a written proposal for dissertation research to the student's advisory committee. Oral defense of the proposal is normally required when the student takes the advanced portion of the preliminary examination.

8. Submission of a dissertation which meets the requirements of the Graduate School, the department, and the student's advisory committee.

3311 Mechanics of Materials (4) Concepts of stress and strain; stress-strain relations and Mohr's circle; static analysis of members; area moment of inertia; stress and displacement analysis of axially-loaded
4530 Biomechanics (3) Designed to introduce the facets and opportunities of biomedical engineering; basic principles, terminology and background knowledge for further courses in the field. Subjects include anatomy, physiology, bioengineering design and application parameters. Design project. Coreq: Mathematics 2840 or consent of instructor.

4310 Introduction to Biomedical Engineering (4) Designed to introduce the topics related to the engineering of human movement and function. Basic principles, terminology and background knowledge for further courses in the field. Subjects include anatomy, physiology, bioengineering design and application parameters. Design project. Coreq: Mathematics 2840 or consent of instructor.

4320 Introduction to Clinical Engineering (3) Designed to introduce the topics related to the engineering of human movement and function. Basic principles, terminology and background knowledge for further courses in the field. Subjects include anatomy, physiology, bioengineering design and application parameters. Design project. Coreq: Mathematics 2840 or consent of instructor.

4340 Perspectives on Medical Ceramics (3) Details development of implant material from both an engineering and a medical viewpoint. Demonstrates results of combined efforts of physician and biomedical engineer. Audiovisual aids and models are used to reinforce lecture topics. Prereq: 3410 and Metallurgical Engineering 2110.

3439 Medical Ceramics Laboratory (1) Surgical observations and laboratory experiments to illustrate design and application parameters. Design project or paper required. Coreq: 3430.

3520 Materials Behavior and Chemical Process Design (3) (Same as Metallurgical Engineering 3520)

3700 Dynamics (4) Kinematics of rigid bodies; mass moments of inertia; coulomb friction; kinetics of rigid bodies using force, mass, acceleration; work-energy; impulse-momentum. Not for departmental graduate credit. Prereq: 2705 or Basic Engineering 1520, Mathematics 2840.

3710 Intermediate Dynamics (3) Three-dimensional dynamic of particles, dynamics of rigid bodies with varying mass; central force motion; LaGrange’s equations. Prereq: 3700, Mathematics 2840.

4420 Engineering Aspects of Infection Control (3) Biomedical engineer’s role in infection control will be related to hospital and clinical activities. Fluid flow phenomena, pressure measurement methods, and basic bacteriological and mycological tests will be demonstrated. Course identifies new and critical role for biomedical engineering in health care systems, and includes analysis of hospital facilities and monitoring systems. Prereq: 3410 or consent of instructor.

4430 Orthopedic Biomechanics (3) Introduction to engineering principles and applications in orthopedics and rehabilitation. Topics include statics, Newtonian mechanics, kinematics, dynamics, vibrations, engineering materials, and biological materials. Prereq: Consent of instructor.

4500 Applied Mechanics for Life Scientists (4) Conceptual and broad coverage of basic principles and concepts of mechanics. Fundamental concepts, statics, vibrations, continuum mechanics and properties of materials. Applications in engineering and medicine. Prereq: Mathematics 1860 or consent of instructor.

4520 Biomedical Fluid Mechanics (3) Discusses objectives, review foundations and present developments in biomedical and fluid mechanics. Properties of human blood and blood vessels, determination of blood flow, analysis and measurement of flow and pressure in arteries, non-steady study of circulatory system, mechanics of microvascular flow, related to areas of major interest: hemolysis, thrombosis, and fluid dynamics of heart assist devices. Prereq: 4500 or a course in fluid mechanics. Coreq: Consent of instructor.

4529 Biomedical Fluid Mechanics Laboratory (2) Measurement and recording of flow characteristics in biological systems. Project and/or term paper required. Coreq: 4520.

4530 Biomechanics (3) Discusses objectives, review foundations and present developments in areas of mechanical properties of living tissues, biomechanics of human body, prosthetic devices, material compatibility of prosthetic devices and biomechanical problems related to impact. Prereq: 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 and crack growth parameters. Thin-films, layers, and J-integrals; the use of these properties in design. Prereq: 3310 and Metallurgical Engineering 2110. (Same as Metallurgical Engineering 4540) 3 hrs and 2 labs.

4590 Principles of Nondestructive Testing (3) (Same as Physics 4580)

4610 Experimental Stress Analysis (3) Basic concepts; theory, techniques, and applications of instrumental analysis methods. Prereq: 3310, Electrical Engineering 2030 or 3110. 2 hrs and 1 lab.

4620 Dynamic Data Acquisition (4) Instrumentation of measuring systems for dynamic events and responses; signal conditioning; oscillographs, oscilloscopes, and magnetic tape recording; telemetry and data transmission; data processing. Prereq: 3311, 3700, Electrical Engineering 3120. 3 hrs and 1 lab.


4710 Fundamentals of Vibrations (3) Free and forced vibrations of damped and undamped lumped parameter systems; energy methods. Prereq: 2720, Mathematics 2840.


4810-20 Engineering Analysis (4, 3) Integration of fundamentals, methods, and numerical methods of analysis with emphasis on application to real and approximate solutions. Introduction to random vibrations. Prereq: 4710 and 4850.

4860 Elementary Structural Matrix Methods (Same as Civil Engineering 4850 and Architecture 4850).

4910 Special Engineering Science Topics (3) Problems related to recent developments and practice. Open to juniors or seniors with consent of instructor. May be repeated. Maximum 6 hrs.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student wishes to graduate before the degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E

5110-20 Fluid Dynamics (3, 3) Fluids and fluid mechanics; introduction to continuum mechanics; various types of fluid motion; practical applications; modern methods of analysis; stresses in simple sections; force, mass, acceleration; work-energy; momentum; impulse-momentum; not for departmental graduate credit. Prereq: 5800, Metallurgical Engineering 4730 or Mechanical Engineering 5540.

5220 Mechanics of Viscous Flow (3) Viscous forces in Newtonian and non-Newtonian fluids; laminar and turbulent flow; viscosity; Poiseuille and Navier-Stokes equations; effects of temperature; boundary layer flow; energy and momentum equations; boundary layer flow; high-speed flow of fluids. Prereq: 5110-20 or 3110. Prereq: 4710 and 4850.


5470 Theory of Linear Viscoelasticity (3) Linear viscoelasticity of solids; quasistatic vibrations; dynamic problems; stability problems; foundation of 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 stress and strain concentration. Prereq: Mechanical methods in photoelastic stress analysis, photoelastic coating methods, three-dimensional photoelasticity. Prereq: 3311, Mathematics 4610, and consent of instructor. 5640. 2 hrs and 3 labs.

5710-20 Advanced Dynamics (3, 3) Physical laws relative to translating and rotating reference frames; rigid body dynamics, conservation laws, Lagrange’s equations; Hamilton’s principle. Prereq: 3110 or 4710, Mathematics 4610.

5730 Advanced Vibrations (3) Vibrations of multiple 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 4550.

5750 Orbital Mechanics (3) Planetary, satellite, and astronautic orbits and trajectories; orbital perturbations; classical principles of minimization. Prereq: 4710 and 4710.

5800 Introduction to Continuum Mechanics (3) Fundamentals of mechanics of solids and fluids; Conservation theorems; constitutive equations; material properties; boundary conditions; continuous medium; constitutive equations, applications to solids and fluids. Prereq: 3130 and 3311 or equivalent. Mathematics 4120.


5850 Introductory Finite Element Methods (3) General finite element procedure; convergence requirements; programming concepts. Stress analysis, heat transfer, fluid flow, and solution of differential equations. Prereq: 5600 or 5310, or Mechanical Engineering 5540, or consent of instructor.

5910 Special Topics in Engineering Mechanics (3) May be repeated with consent of department. Prereq: Consent of instructor. May be repeated with consent of department.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Advanced Topics in Fluid Mechanics and Computational Fluid Transfer (3, 3) Survey of literature on advanced convective momentum, heat, and mass transfer; boundary layer theory based on the Navier-Stokes equations; mathematical and computational methods in fluid mechanics; phenomenon theories of turbulence; turbulent boundary layer flow; high-speed flow of fluids in non-uniform gradients. Prereq: 5110-20 or 3110. Prereq: 4710 and 4850 or equivalent. Mathematics 4610, 4540-50, 4710. (Same as Environmental Engineering 6110-20).


6310 Theory of Plates (Classical) Theory of bending of plates of various shapes; thick plates; plates of variable thickness; buckling and large deflection problems. Prereq: 5310-30-36.

6320 Analysis and Design of Thin Shell Structures (3) Geometry of surfaces, derivation of thin shell theory; and applications of theory for structural engineers. Prereq: 6310 or Civil Engineering 5160.


6430 Theory of Plasticity (3) Yield conditions; strain hardening and deviatoric equations; plastic potential; uniqueness theorems; extremum and variational principles; problems in 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 applications of three-dimensional photoelasticity, scattered light method, dynamic photoelasticity, photothermoelasticity, photoplasticity and photoviscoelasticity, recent developments in photoelasticity. Prereq: 5640, 5420 and consent of instructor. 2 hrs and 3 labs.

6710 Impact and Stress Waves in Solids (3) Mechanical impact; wave propagation in elastic solids; impact and waves in elastic rods, beams, and plates; contact problems in impact of elastic bodies; dynamic loading in viscoelastic and plastic materials; dynamic properties and materials. Prereq: 5410. Coreq: Mathematics 5630.

6800 Nonlinear Viscoelasticity (3) (Same as Polymer Engineering 6210.)

6810 Energy Methods (3) Virtual work, minimum potential energy, and complementary energy; Castigliano’s theorem. Hamilton’s principle, and LaGrange’s equations of motion; variational methods; examples from theory of structures, plates and shells, and beams. Prereq: 5710-20 and Mathematics 5610-20-30.

6910 Special Topics in Engineering Mechanics (3) Application of problems of interest in mechanics, worked either as group or individually. Prereq: Consent of instructor. May be repeated with consent of department.

NOTE: Not all of the above courses will be offered in any one year.

Industrial Engineering

MAJOR

DEGREES

M.S., M.E.

Professors: J. J. Snyder (Head), Ph.D., Ohio State, P.E.; D. C. Dowler, M.S., Tennessee, P.E.; H. P. Emerson (Emeritus), S.B. Massachusetts Institute of Technology, Ph.D., R. M. LaForge, (Emeritus), M.S., Georgia Institute of Technology, P.E.; H. L. Lovelace, M.S. North Carolina State, P.E.; W. G. Sullivan, Ph.D., Georgia Institute of Technology, P.E.

Associate Professors: J. A. Buchan, M.S. Georgia Institute of Technology, W. S. Christianson, Ph.D. Virginia Polytechnic Institute, P.E.; D. H. Hutchinson, Ph.D., Georgia Institute of Technology.

Assistant Professors: E. L. Deporter, Ph.D., Virginia Polytechnic Institute; M. L. Eaton, M.S. Clarkson, P.E.; M. S. Goorden, M.S. Tennessee, P.E.

THE MASTER'S PROGRAM

A graduate program leading to the degree of Master of Science requires 32 credit hours for graduate study. Students may elect courses from a variety of recognized undergraduate curricula in industrial engineering or to graduates of other engineering curricula who take up to 15 quarter hours of prerequisite course work. A non-thesis option with 45 hours of course work plus a 3-hour design project is available.

Graduate work in Industrial Engineering provides for concentrations in operations research, industrial administration, manufacturing and production systems, human factors engineering, and systems engineering. Either one or two minors can be elected in Engineering, Mathematics, Psychology, Business, Computer Science, Statistics, or Economics.

MASTER OF ENGINEERING PROGRAM

This professional degree program is intended as a culmination year in a five-year baccalaureate-master program which emphasizes engineering design and professional practice. Admission requires 30 credits of courses beyond the courses mentioned above plus the requirement of a Bachelor’s degree from an ECPD-accredited engineering program. This 45-quarter hour program requires 18 hours of course work in an industrial and engineering project of 15 hours of technical methods electives, 9 hours of industrial engineering design electives and 9-hour thesis or design project.

4060 Material Requirements System Design (3) Theory and applications of forecasting, production planning, inventory analysis, planning and control, and systems design and implementation. Design of the material requirements process as an integrated system. Prereq: 3510-20. Not available for graduate credit for industrial engineering students.

4080 Forecasting Methods in Industrial Engineer- ing (3) Application of technological forecasting techniques to industrial engineering problems. Includes moving averages and exponential smoothing, linear and polynomial regression models, autoregressive time-series analysis, Delphi methods and other selected industrial forecasting methods. Prereq: 4060.

4150 Project Control with CPM and PERT (3) A study of project planning and control based primarily on "critical path" techniques, including resource allocation, computerized project control, and computer programs. Prereq: 3540.

4160 Materials Handling (3) Analysis and planning for the overall problem of moving, packaging, and storing of materials; equipment comparison and selection, cost analysis. Prereq: 4520 and Engineering Science and Mechanics 3310. Not available for graduate credit for industrial engineering students.

4170 Automatic Process Control (3) Characteristics of automatic control systems and controllers; elementary open and closed loop analysis, and applications to industrial control systems. Mathematics 2890 and Engineering Science and Mechanics 2720.

4230 Scheduling Systems (3) Performance measures for shop flow and flow shop scheduling, including both static and dynamic conditions, as well as techniques for solving specific scheduling problems. Deterministic and probabilistic dispatching conditions. Prereq: 3520.

4250 Work Measurement Applications (3) Application of methods and techniques for measuring time and motion studies. Prereq: 4240 and a prescribed classroom and laboratory experience in work measurement.

4260 Engineering Economy (3) Problems and principles in selection or replacement of equipment. Decisions among engineering alternatives, involving capital recovery, economic life of equipment, and rate of return on investment. Not available for graduate credit for industrial engineering students.


4540 Industrial Development (3) Factors other than mechanical or chemical which enter into successful establishment of new enterprises, factory and cost and location studies and market analysis to determine the commercial feasibility of new plants or projects.


4600 Health Systems Engineering (3) Hospital management systems and means by which they may be improved through application of modern industrial engineering principles and techniques.

4650 Industrial Systems Analysis (3) Matrices and linear vector spaces for industrial systems models. Laplace and Z-transform techniques and applications of these methods to industrial systems. Applications to industrial processes and systems. Prereq: 3510, 3520 and Mathematics 2890. Not available for graduate credit for industrial engineering students.

4710-20-30 Special Industrial Engineering Topics (3, 3, 3) Prereq: Consent of instructor. May be repeated up to 30 hours.

4800 Industrial Safety (3) Development of organization and programs for prevention and control of accidents with emphasis on OSHA Rules and Regulations.

5000 Thesis (1-15) E

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

5110 Work Design (3) Advanced methods of analysis, design, and implementation of work systems, human factors, workers' response and management participation. Prereq: Motion and time study work method courses and consent of instructor.

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 systems planning or consent of instructor.

5250 Advanced Scheduling (3) Scheduling problems with mathematical closed form solutions. Application, analysis, and development of heuristic procedures for scheduling, emphasis on on-budget and on-time scheduling. Prereq: 4230.

5260 Information Systems Design (3) Systems engineering approach to information systems design. System models, analysis, and evaluation of information systems, information objectives and design criteria. Optimization and simulation in system design.

5850 Dynamic System Simulation (3) Development of complex models, under funda-
mental assumptions, analysis of dynamic systems, simulation techniques in
systems design. Prereq: 4590 and Computer Science 5450.

5900 Design Project (1-6) Industrial engineering techniques to solve research
problems. Prereq: satisfactory completion of thesis program. Enrollment limited to industrial en-
engineering students in non-thesis program. May be repeated. MHRM 5150.

5910-20-30 Special Topics in Industrial Engineer-
ing (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.

6400 Probabilistic Methods in Engineering Sys-
tems (3) Applications of probabilistic methods. Advanced topics in reliability, renewal theory, mainte-
inance, and Markov processes. Prereq: 5360 and 5420 or 5730.

6520 Operations Research Models in Engineering
Economics (3) Traditional capital planning and budgeting techniques; operations research ap-
proaches to capital budgeting problems. Mathe-
matical programming and computer simulation. In-
terrelated problems, uncertain cash flows, and choice of appropriate evaluation criteria. Prereq: 5520, 5710.

6700 Nonlinear Programming (3) Optimization techniques for static and dynamic nonlinear sys-
tems subject to various constraints. Applying op-
timization theory to solve nonlinear optimization problems. Variable metric methods, search
methods, constrained nonlinear programming, and penalty function methods. Prereq: 5760.

6730 Dynamic Programming (3) Solving multi-stage optimization problems as sequence of single-stage
optimization problems. Computational and theoriet-
al aspects of dynamic programming. Decision making under certainty and risk. Prereq: 5710.

6740 Advanced Topics in Optimization of Dynamic
Systems (3) Multi-stage optimization theory. State
increment dynamic programming, adaptive optimi-
tization theory, and other selected topics. Prereq: 6730.

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

MAJORS

Mechanical Engineering

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

Professors:
M. W. Milligan (Head), Ph.D. Tennessee, P.E.;
F. Bai, Ph.D. Idaho, P.E.;
A. J. Edmondson, Ph.D. Texas A & M., P.E.;
W. Frost, Ph.D. Washington (Seattle);
B. H. Goertzen, Ph.D. Kansas State;
K. E. Harwell*, Ph.D. California Institute of
Technology; J. W. Hodges, Ph.D. Georgia
Institute of Technology; P. R. H. Holland,
M.S. Tennessee, P.E.; W. S. Johnson, Ph.D.
Clemson, P.E.; E. Lumsdaine, Ph.D. New
Mexico State; R. L. Maxwell, M.S. Case
Western Reserve, P.E.; F. Shahrokh*, Ph.D.
Oklahoma; F. H. Speckhart, Ph.D. Georgia
Institute of Technology; P. E. J. Wu;
K. T. Lung, Ph.D. California Institute of
Technology; Y. L. Wu*;
R. L. Young; Ph.D. Northwestern, P.E.

Associate Professors:
S. E. Becker*, Ph.D. North Carolina State, P.E.;
C. Brown, M.S. Tennessee, P.E.;
S. H. Chen, Ph.D. Georgia Institute;
F. G. Collins*, Ph.D. California (Berkeley);
J. A. Euler, Ph.D. Purdue, P.E.; T. Feagin*,
Ph.D. Texas; E. G. Keshock, Ph.D. Oklahoma
State; R. Krane, Ph.D. Oklahoma;
J. R. Mask Jr., Ph.D. North Carolina State;
J. H. Moulin, Ph.D. Pennsylvania State;
L. L. Red;
R. D. Southern Methodist; P.E.; G. V. Smith,
Ph.D. Pennsylvania State, P.E.; J. W. White,
Ph.D. Stanford; H. J. Wilkerson, Ph.D. Tennessee, P.E.

Assistant Professors:
J. A. Armitill, Ph.D. Polytechnic Institute;
J. K. Koester*, Ph.D. California Institute of
Technology; M. Parang, Ph.D. Oklahoma.

GRADUATE STUDY PROGRAMS

Graduate programs in Mechanical Engineering or Aerospace Engineering are available which lead to the degrees of Master of Engineering, Master of Science, and Doctor of Philosophy with concentrations in solar energy, energy conversion and utilization, power generation, machine design and dynamics, aerodynamics and gasdynamics, aeroacoustics, stress analysis, propulsion, heat transfer, fluid mechanics, and thermodynamics. In addition to the general policies and requirements of the Graduate School, each student must satisfactorily complete a program of study which has been approved by the student's committee. Specific program requirements are given below.

MASTER OF ENGINEERING PROGRAMS

Entrance into the Master of Engineering program is restricted to qualified students of ECPD-accredited undergraduate curricula in mechanical or aerospace engineering. At least one-third of the program of study must be classified as engineering design. The student's advisor will assist in planning the program of study so as to include the necessary design content. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

MASTER OF SCIENCE PROGRAMS

Entrance into the Master of Science programs is available to qualified graduates of recognized undergraduate curricula in mechanical or aerospace engineering and to qualified graduates of other curricula who satisfy the necessary prerequisites. Three program options (thesis, course, and problems) are described below. Note that some students may not be eligible for the course option.

MASTER'S PROGRAM OPTIONS

Three program options are available: A. The Thesis Option. 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 9 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 of 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 all 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 5 quarter hours credit in doctoral dissertation.

3. A minimum of 18 quarter hours in mathematics in courses numbered 4000 or above.

4. A minimum of 36 quarter hours in mechanical and/or aerospace engineering courses numbered 5000 and above, with at least 12 quarter hours of 6000-level courses. These are exclusive of thesis, problems or dissertation credit.

5. Participation in the departmental seminar program.

GRADUATE CREDIT FOR UNDERGRADUATE COURSES

Junior (3000-level) and senior (4000-level) mechanical and aerospace engineering courses may be taken for graduate credit by non-mechanical or non-aerospace engineering majors, if approved by the student's major department. Mechanical or aerospace engineering majors may not normally use more than one 4000-level engineering course to meet their advanced degree requirements. Non-mechanical or non-aerospace engineering graduate students should consult with instructors regarding prerequisites for undergraduate courses.

Mechanical Engineering

3000 Energy—An Overview (4) Introduction to analytical, experimental, theoretical, and computational methods for design, advanced power generation systems, energy production and utilization, power generation techniques including conservation of energy; emphasis on the environmental impact of energy power plants for public utilities or industrial applications; selected design and layout problems.

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.

3300 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 principles.

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.

3610 Mechanics of Machinery—Kinematics (3) Machine motions, graphical and analytical methods; instant centers; velocities; accelerations.

3620 Mechanics of Machinery—Dynamics (3) Applications of Newton's laws, work, energy, and impact to machinery. Force analysis of mechanisms, balancing, gyroscopic effects, flywheels. Prereq: 3610.


3650 Introduction to Machine Design (3) Ductile-brittle behavior of materials under static and cyclic loading. Stress concentration, design factors and theories of failure. Changes in material behavior in processing and fabrication: 2 hrs and 1-2 hr lab.

3910 Engineering Analysis (3) Advanced analysis techniques for problems of aerospace and mechanical engineering. Emphasis on approximate methods.

4140 Energy Conversion Systems (3) Laws governing energy transformations and their application to power plants.

4150 Energy Conversion Systems (3) Operating and design characteristics of new technology energy conversion systems, selected direct conversion techniques.

4160 Energy Conversion Systems (3) Economic and technical design parameters as applied to power plants for public utilities or industrial applications; selected design and layout problems.

4170 Turbo-Machinery (3) Basic principles of turbo-machinery; systematic methods or analysis, design, performance evaluation.

4180 Energy Production and Utilization (3) Thermodynamics constraints on energy production; comparison of power generation methods; evaluation of new energy sources and concepts; energy conservation schemes.

4220 Environmental Noise (3) Basic principles of acoustics—measurement and control of noise in industrial and community environments.

4340 Heat Transfer (3) Heat transfer by free and forced convection, heat transfer in phase change, heat transfer in high speed flow, heat exchanger applications.

4450 Lubrication (3) Hydrodynamic theory of lubrication of sliding bearings; application of Newton-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, interpreting experimental tests, results 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 non-mechanical graduate credit.

4520-30 Creative Design (3, 3) Application of engineering principles to the solution of current problems with emphasis on design innovation.

4621 Manufacturing Processes (3) Comparison of machining methods; plastic production; metrology.

4622 Tool Design (3) Principles underlying tool 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, including part design, design planning, tool and fixture design, selection of manufacturing operations, redesign of product to reduce cost.

4625 Manufacturing Process Engineering I (3) Product specification: dimensional analysis of size and form; true position tolerance theory; tolerance analysis; and workpiece control for production to tolerances.

4631 Energy Methods in Mechanical Design (3) Application of strain energy principles in complex beams and structures.

4632 Application of Lagrangian Mechanics in Vibration Problems (3) Generalized coordinates and multiple degree of freedom vibrating systems.

4633 Matrix Analysis (3) Application of matrices to solution of complex structures and lumped parameter vibrating systems.

4660 Materials and Manufacturing Process (3) Selection of materials in design process, emphasizing relationship between stress and strain analysis, material properties, environment, temperature, manufacturing and technology utilization.

4670 Machine Elements (3) Application of strength and properties of materials, design factors, theories of failure to design machine elements, springs and shafting, 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 shafting, 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 of air washers, cooling towers and extended surface coils; solar radiation, building heat transmission; physiological effects.

4730 Thermal Environmental Systems (3) Design of heating ventilation and air conditioning systems.

4740 Solar Energy Utilization (3) Nature and availability of solar radiation, review of selected heat transfer topics pertinent to solar energy collection and use; design and analysis of solar energy collectors and method of storage; selected applications.

4810 Internal Combustion Engines (3) Thermodynamic principles of internal combustion and propulsion engines. Combustion, detonation,
equilibrium, dissociation. Analysis of internal combustion engines using ideal and real fluids.
5430 Propulsion System (3) Design of propulsion engines for and supporting systems.
4910-20-30 Selected Topics in Mechanical Engineering (3, 3, 3) Problems related to developments and practice in mechanical engineering.
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Celebration (3-15) Recognition of students 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 Conduction Heat Transfer (3) Analysis of steady state and transient heat conduction 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 fluid properties. Prereq: 5310 or equivalent.
5140 Phase Change Heat Transfer (3) Prereq: 5120.
5210 Classical Thermodynamics (3) Macroscopic thermodynamics with emphasis on First and Second Laws of Thermodynamics. Equilibrium and thermodynamics of phase relationships. Prereq: 3330.
5220 Microscopic Thermodynamics (3) Thermodynamic properties, kinetic theory and statistical mechanics. Prereq: 5210.
5230 Special Topics in Thermodynamics (3) Prereq: 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.
5610-20-30 Experimental Stress Analysis (3, 3, 3) Theory of elasticity; experimental methods; photo-elasticity; strain gages. Prereq: 3650.
5640-50-60 Advanced Machine Design (3, 3, 3) Design of bearings, gears, shafting; lubrication.
5670-80-90 Dynamics of Machinery (3, 3, 3) Dynamics of machines; vibrations; balancing flywheels and governors.
5710 Metal Machining (3) Analytical approach to mechanics of machining. Basic phenomena-plastic flow, fractures, friction and wear. Prereq: 3650, 3440, and Metalurgical Engineering 2110.
5840-50-60 Turbomachinery Systems (3, 3, 3) Design, development, and systems integration of turbomachinery components. Prereq: First year graduate standing and consent of instructor.
5870 Dynamic Modeling and Simulation (3) Modeling physical systems including mechanical, thermal, hydraulic, electrical, and electromagnetic systems. Techniques for experimentally determining system parameters. Analog and digital computer simulation techniques. Prereq: 3650, 4420, and Aerospace Engineering 3511.
5900 Selected Engineering Problems (3-9) Selected problems in mechanical engineering to fulfill requirements of Program. Enrollment limited to students in Program. 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.
5960 Special Topics in Mechanical Engineering (1-3) May be repeated.
6000 Doctoral Research and Dissertation (3-15) E
6110-20 Advanced Topics in Fluid Mechanics and Heat Transfer (3-3) Advanced theory and applications of fluid mechanics and heat transfer; natural convection, two-phase flows, high speed reacting and non-reacting flows, advanced boundary layer techniques. Prereq: Consent of instructor.
6130-40 Advanced Radiation Heat Transfer (3, 3) Radiation heat transfer absorbing, emitting and scattering media; interaction of thermal radiation with conduction and convection heat transfer; radiation heat transfer in hypersonic flow; radiative characteristics of non-gray and non-transparent gases; scattering by planetary atmosphere. Prereq: 5110-20-30; Mathematics 4550.
6420 Selected Topics in Thermodynamics (3) Comparison of thermodynamic processes; application of the laws of thermodynamics; equilibrium of pure substance; meta-stable states. Prereq: Consent of instructor.
6430 Selected Topics in Thermodynamics (3) Advanced Radiation Heat Transfer.
6610 Engineering Vibrations (3) Mechanical transients. Linear and nonlinear single degree of freedom systems. Prereq: Consent of instructor.
Aerospace Engineering
3610 Dynamics (3) Newton's Law: work-energy impulse-momentum. Lagrange equations, central force, gyroscopic effects. Applications to aerospace systems.
3620 Mechanical Vibrations (3) Free and forced vibrations of single and multiple degree vibrating systems, balancing of rotating machinery. Prereq: 3650.
3630-40 Structural Analysis of Aerospace Vehicles (3, 3) Fundamental analysis as applied to configurations of aerospace interest. Introduction to aeroelasticity phenomena. Must be taken in sequence.
4110 Aerodynamic Fundamentals (3) Atmosphere, dynamics and thermodynamics of perfect gases, fluid flow theory, wing theory, drag. Prereq: 5240 for 5210, and 5210 for non-aerospace engineering majors only.
4210 Aircraft Propulsion and Performance (3) Propellers, propulsion systems for aircraft, static performance and special performance problems, propellers, operation; boundary layers, stability and control. Prereq: 5210 for non-aerospace engineering majors only.
4210 Compressible Flow (3) One-dimensional internal flow; shock and expansion waves; friction and nonadiabatic flow.
4220 Low Speed Aerodynamics (3) Potential flow theory; kinematics and dynamics of perfect fluids; analysis and design of aerodynamic bodies.
4230 Viscous Flow (3) Boundary layer theory; laminar and turbulent flow; compressibility effects; numerical solution methods.
4240 Astronautics (3) Propulsion, trajectories, guidance, control, and atmospheric reentry of space vehicle systems.
4250 Propulsion (3) Principles of propulsion devices; turbojet, ram-jet, and rocket engines.
4260 System Design (3) Synthesis of aerospace system. Design report on the system.
4471-91 Experimental Aerospace Engineering (3, 3) Experimental methods and measurements of force, length, time, temperature, pressure, transport rates and physical properties, with emphasis on control, analyzing, and reporting experimental tests run according to test standards and other specifications.
4510 Airplane Performance (3) Introduction to airfoil and wing characteristics, drag; propellers; static performance and maneuvers; theory and design of control surfaces, stability.
4910 Selected Topics in Aerospace Science (3) Current problems in solid and theoretical, fluid science and engineering required for an understanding of the several areas of aerospace science.
5000 Thesis (1-15) E
5002 Non-Thesis Graduation Celebration (3-15) Special topics 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 Fundamentals of Aerodynamics (3) Kinematics and dynamics of perfect fluids; potential flow about a body; experimental mapping. Prereq: 4220 or Mechanical Engineering 5310, Mathematics 4250.
5120 Experimental Methods in Fluid Mechanics (3) Experimental techniques with laboratory experiments; hot wire anemometry and turbulence measurements; flow visualization, wind tunnel tests (supersonic and subsonic); rarefied gas flow; instrumentation, supersonic flow measurements, boundary-layer measurements. Prereq: 4210-20-30 or Mechanical Engineering 5310 or equivalent.
5150-60-70 Air Vehicle Aerodynamics and Performance (3, 3, 3) Application of aerodynamics to air vehicles to provide estimates of performance, stability, and control characteristics for subsonic to hypersonic speeds. Relations among thrust, drag, lift and altitude. Propulsion systems, vehicle performance characteristics, and trajectory optimization. Prereq: 4220.
5210-20 Aerodynamics of Compressible Fluids (3, 3) One-dimensional flow; waves; small-perturbation theory, shock waves; viscous interactions; free molecule and rarefied gas flow. Prereq: 5240.
5250 Selected Topics in Aerodynamics (3) Transonic, 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 considerations. Aerodynamic testing of wind tunnels, shock tubes, hotwires and ballistic ranges; propulsion test facilities for air breathing and rocket engines. Space environment. Theoretical and practical considerations of space environment test facilities. Prereq: 5240; Mechanical Engineering 5130 and 5230.
5310 Magnetohydrodynamics (3) Electromagnetic field theory; chemical kinetics; thermodynamic and thermophysical properties of gas systems; governing equations and applications. Prereq: 4220 and Mathematics 4710.
5340-50 Atmospheric Entry (3, 3) Motion and heating along ballistic and lifting trajectories; dynamic stability; heat protection systems. Prereq: 5250. Recommended: 5240.
5440-50 Transonic Flow (3, 3) Theoretical and experimental aspects. 5440—Nature of flow at transonic speeds and delimitation of flow regimes —nonlinear nature of flow, strong viscous interaction, development of small disturbance equations and similarity parameters —shock wave in transonic flow and assumption of irrotational motion, solution techniques. 5450 —Shock-wave boundary layer interaction of conesus lenses, design of shock-free
flows, wind tunnel testing at transonic speeds, interference problems. Prereq: 5220 or equivalent.


5540-50 AerospAce Vehicle Stability and Control (3, 3) Aircraft stability control. Static and dynamic longitudinal, directional, and lateral stability and control under various flight conditions. Must have free and fixed control surfaces through a wide flight speed range. Automatic stability and control. Application to missiles. Prereq: 4230 and 5530.


5610 Applied Acoustics (3) Energy flow in acoustics, general equations of sound propagation in inhomogeneous moving medium, sound waves due to turbulence, vertical sound, pseudosound, propagation and absorption of sound in ducts, instrumentation and measuring techniques. Prereq: Consent of instructor.

5620 Aeroacoustics (1) Special topics and recent research results in field of aeroacoustics. Turbo-machinery noise, jet noise, and general theoretical developments, empirical equations. Prereq: 5610.

5810 Aviation Systems: An Overview (3) Aviation systems, present and future, emphasis on systems approach. Socioeconomic basic, aerospace and propulsion technology, meteorology, air traffic control, airport-community interface, and technological trends and developments pertinent to present status and future development of air transportation. For non-aerospace and non-mechanical engineering majors only. Prereq: 4120.

5820 Air Vehicles (3) Current capabilities and future requirements for air transport vehicles. Parameters significant in air vehicle type selection. Integration of air vehicle into aviation system. For non-aerospace and non-mechanical engineering majors only. Prereq: 5810.

5900 Selected Engineering Problems (3-9) Selected problems in aerospace engineering to fulfill requirement of Problems Program. Enrollment limited to students in Problems Program. Prereq: Consent of advisor. May be repeated. S/NC only.

5950 Seminars (1) All phases of aerospace engineering, including reports on current research at The University of Tennessee, Knoxville. May be repeated. S/NC only.

5990 Special Topics in Aerospace Engineering Credit to be arranged; 3 hrs maximum each quarter.

6000 Doctoral Research and Dissertation (3-15) E


6330 Magnetohydrodynamics III (3) Engineering applications of magnetohydrodynamics, propulsion and power generation. Prereq: 6300, Mathematics 5630.

6410 Physical Gasdynamics (3) High-speed, high temperature flow of gas from molecular point of view; molecular and kinetic theory; equilibrium properties of gases and gas mixtures from steady-state kinetic theory chemical thermodynamics, nonequilibrium properties of gases. Prereq: 5220 and Mechanical Engineering 5220.

6420 Physical Gasdynamics (3) Continuation of 6410; flows of gas mixtures in local thermodynamic and chemical equilibrium and nonequilibrium basis of rate equations; flow with vibrational and chemical nonequilibrium. Prereq: 6410.

6510-30 Advanced Aerodynamics (3, 3) Subsonic, 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 consequences. 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) Derivation and critical review of governing equations. Asymptotic solutions; similarity methods; boundary layer transition. Integral methods to include compressibility and heat transfer. Attached and separated flows; shock-wave boundary layer interaction. Prereq: 5220, Mechanical Engineering 5120, and Physics 5530.

6910 Advanced Topics in Gas Dynamics (3) Selection of topics based on particular interests of students; nonequilibrium, nonisentropic gaseous flows, advanced kinetic theory, perturbation techniques. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

DEGREES

Nuclear Engineering

MAJOR DEGREES

Nuclear Engineering M.S., M.E., Ph.D.

Professors:
P. F. Pasqua (Head), Ph.D. Northwestern, P.E.;
J. B. Russell, Ph.D. Georgia Institute of Technology;
F. W. Kerlin, Ph.D. Pennsylvania;
J. E. Mott, Ph.D. Minnesota, J. C. Robinson, Ph.D.
Pennsylvania, P. N. Stevens, Ph.D. Northwestern, P.E.

Associate Professors:
H. L. Doods, Ph.D. Tennessee, P.E.;
H. C. Roland, Ph.D. Tennessee.

Assistant Professors:
E. M. Katz, Ph.D. Tennessee; L. Miller,
Ph.D. Texas A & M; B. Upadhyaya, Ph.D.
University of California.

The Department of Nuclear Engineering offers degrees leading to the Master of Science, Master of Engineering, and Doctor of Philosophy with concentrations in nuclear dynamics, nuclear reliability and risk, and radiation transport.

MÆTER OF SCIENCE PROGRAM

A graduate program leading to a degree of Master of Science is available to graduates of recognized undergraduate curricula in engineering and physics. Each applicant will be advised as to the most suitable prerequisite courses before he/she enters the program.

The student must complete a program of study of 45 quarter hours which has been approved by the thesis advisory committee and which includes the following:

1. A major consisting of a minimum of 18 quarter hours of graduate courses in nuclear engineering.
2. A minimum of 9 quarter hours in mathematics, statistics or computer science.
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 meets equivalent criteria.

1. A minimum of 12 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). Documentation 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 elect this option must complete the following:

1. The 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 the preliminary 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 the thesis or dissertation credit.
4. A minimum of 18 quarter hours in
84 College of Engineering

mathematics, computer science, or in statistics in courses beyond nuclear engineering undergraduate requirements. Must be numbered 4000 or above. A minimum of 9 quarter hours in courses numbered 5000 or above from a department other than nuclear engineering. The choice depends on the student's overall program and should expand his/her knowledge in a given field.

6. A reading knowledge of one foreign language will be determined by the student's doctoral committee.

4110-20-30 Introduction to Nuclear Reactor Theory (3, 3, 3) Nuclear structure, radiative decay law, 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 3730, 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 spectrometry, cross-section measurements, and computer calculation; 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


4720 Reactor Thermal Design (4) Hydrodynamics and heat transfer in boiling systems; boiling crises; fuel element thermal design, steam generator design. Prereq: 4710. W

4730 Nuclear Reactor Design (3) First order reactor design, integration with non-nuclear heat transfer and power conversion system, economic evaluation; optimization procedures, description of typical systems. Coreq: 4130. Sp

4810 Radiation Shielding (3) Types of radiation sources, gamma ray and neutron attenuation, biological effects of radiation, reactor design. Prereq: Physics 3730, Mathematics 4550. Sp

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: 4120.

4930 Nuclear Fuel Management (3) Discussion of problems associated with processing of nuclear materials; fuel cycle analysis; burnup calculation. Prereq: 4120. W

5000 Thesis (1-15) E

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

5110-20-30 Transport Processes in Nuclear Engineering (3, 3, 3) Momentum and mass transport; development of conservation equations; elementary theory of turbulence; heat transfer and flow through conduits; conduction; radiation; reactor core thermal analysis. Prereq: 4720 or equivalent. Mathematics 4710, 4650. F; W; Sp

5210 System Dynamics (3) Transient analysis, Laplace transforms, frequency response, stability (linear and non-linear), and sensitivity analysis by state variable methods. Dynamic analysis of distributed systems. Prereq: Consent of instructor. F

5220 Reactor System Dynamics (3) Application of methods of general system dynamics to reactor systems. Modeling of nonlinear and non-linear processes. Dynamics, stability, and control of zero power reactors and power reactor systems. Prereq: 4210, 4130 or equivalent. W


5240 Reactor Instrumentation (3) Instrument components and systems for operation, control, and safety of nuclear reactors; role of instrumentation in public health and safety; engineered safeguards for nuclear power plants. Prereq: 4820, or consent of instructor. A

5310-20-30 Nuclear Systems Reliability (3, 3, 3) System reliability analysis as applied to nuclear systems. Qualitative and quantitative methods. Coreqs: Statistics 3450, F; W; Sp

5310-20-30 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.


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 inharmonic imbedding cases studied. Prereq: 4610. F


5840-50 Fast Breeder Reactors (3, 3) Special characteristics of fast breeder reactors; emphasis on LMFBR. Need for breeders; neutron physics and thermal characteristics of reactor core; development status of engineering components; fuel cycle cost analysis; safety; coolants other than sodium; world status of development.

5870 Special Topics in Nuclear Engineering (3) Lectures and recitation on recent advances in nuclear engineering. Prereq: Consent of instructor. May be repeated with consent of department.

5980 Nuclear Engineering Practice (3-12) Experiences in solving and reporting on engineering problems. Prereq: Approval of Nuclear Engineering Department. May be repeated. Only Alternate Plan students may take this course. S/NC only. E

6000 Doctoral Research and Dissertation (3-15) E

6110-20-30 Selected Topics in Reactor Theory (3, 3, 3) Transport theory, control rod theory, and perturbation theory. Selected topics from literature. Prereq: Consent of instructor. F, W, Sp

6140 Radiation Shielding (3) Advanced topics in radiation shielding, Monte Carlo techniques and space radiation problems. Natural space radiators, energy-source radiators, dose conversion, probabilistic, Selected neutron, gamma, and space-radiation shielding problems. Prereq. Consent of instructor.

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.

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
Graduate study programs lead to the degree of Master of Science in Child and Family Studies; Consumer Studies and Housing; Public Policy; Interior Design and Housing; Food Science; Food Systems Administration; Vocational-Technical Education (concentration in home economics education); Nutrition; and Textiles and Clothing. Graduate study programs lead to the degree of Doctor of Philosophy in Home Economics with three options: interdisciplinary, food science, and nutrition. Graduate programs provide advanced specialized training needed for college and university teaching, for leadership positions in governmental and professional agencies, in the various professions in business, for secondary school and adult teaching, for research and for extended services.

GENERAL REQUIREMENTS FOR GRADUATE STUDENTS

Requirements for graduate study are prescribed by the Graduate School and by the student's major department. Students lacking adequate preparation may be required to take additional courses at the undergraduate level as prerequisites to graduate study. A student deficient in English may be required to take courses as necessary to remove the deficiency.

APPLICANTIO FOR ADMISSION

Two copies of the student's transcript and an application for admission are submitted directly to the Graduate School. In addition, a College of Home Economics application and three reference letters are sent to the Associate Dean of the College of Home Economics. (Forms may be obtained from the college.)

The Graduate Record Examination scores for the aptitude test including the quantitative, verbal, and analytical sections are required for the application for admission in the interdisciplinary doctoral program, the Master's program in Child and Family Studies, and the Master's program in Consumer Studies and Housing; Public Policy.

In submitting applications for admission to graduate study in home economics, students are requested to indicate choice of major area of study.

GRADUATE ASSISTANTSHIPS AND FELLOWSHIPS

Information and application forms regarding graduate assistantships, fellowships and general requirements for admission to graduate study may be obtained from the department head in the area of the student's major interest or from the Associate Dean of the College of Home Economics for the interdisciplinary doctoral program.

PROGRAMS LEADING TO THE DEGREE OF MASTER OF SCIENCE

**Thesis Option.** Majors and minors are offered in the following areas:

- Child and Family Studies
- Consumer Studies and Housing: Public Policy*
- Interior Design and Housing

*Requirements include Interior Design and Housing 5615 or Child and Family Studies 5170, Child and Family Studies 5700 or Planning 5100 or Economics 5340 or Agricultural Economics 4330, and Home Economics 5600. Three-hour course in research methods or statistics. Twenty-four hours in consumer studies or housing to include 9 hours of Child and Family Studies 5000 or Interior Design and Housing 5000.

- Consumer studies courses to be selected from Child and Family Studies 5140, 5170, 5180, 5700, 5800, 5900; Interior Design and Housing 5120; Food Science 4040; Textiles and Clothing 5180; Agricultural Economics 4710; Economics 5050-60; Political Science 5641, 5670-80, 5710; Library and Information Science 5250.

- Housing courses to be selected from Agricultural Mechanization 5110, 5610; Interior Design and Housing 4330, 5615, 5610-30, Planning 5360-80, 5450; Geography 5520.

- Twelve hours in an area of home economics other than the area (consumer studies or housing) chosen above. Minimum 27 hours in 9 hours outside College of Home Economics. Minimum of 27 hours 5000-6000 level courses and total minimum of 45 hours. Courses may be used to meet more than one requirement but all minimum requirements will need to be met.

**Non-Thesis Option.** The non-thesis option is available for all majors listed under the thesis option and is the only option available for public health nutrition.

In addition to the regulations of the Graduate School, 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 and 18 hours at the 5000 and 6000 level. A minimum of 27 hours of 5000 and 6000 level courses is required in the program. Some majors may require 9 hours in one collateral area.

Request for the non-thesis option must be made in writing by the student to the department head not later than the end of the first term in residence.

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**Nancy H. Belck, Dean**  
**Lura M. Odland, Emerita**  
**Grayce E. Goertz, Associate Dean**  
**Virginia S. Anagnost, Assistant Dean**
DOCTORAL PROGRAMS

The doctoral program in Home Economics provides three options for study: interdisciplinary, food science, and nutrition. The interdisciplinary option is available in all departments in the College of Home Economics. The doctoral program with a major in Home Economics requires:

1. A minimum of 96 quarter hours in courses beyond the Bachelor's degree in economics requiring:
   - interdisciplinary, food science, and nutrition.

DOCTORAL PROGRAMS

1. A minimum of 12 quarter hours of 6000-level courses in food science or in food systems administration.
2. Selection of an option and fulfillment of the requirements as supervised by the faculty committee.
3. The faculty committee for each doctoral student shall determine whether a reading knowledge of a foreign language is required.
4. Doctoral research and dissertation:
   - (minimum 36 hours; maximum 48 hours) may be included in the 96 hours presented for the degree.
5. A final examination.

Option Requirements

Interdisciplinary option:

1. Home Economics 6110-20, 6210.
2. Twenty-four to 36 hours from at least two departments in the College of Home Economics representing one of the following concentrations:
   - Individual and Family Behavior: as related to development and change throughout the human life cycle. Emphasis may be on: normal developmental processes, in individuals and families; socialization through childhood, adolescence, and adulthood; interactions in these 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: in humans throughout the life cycle. Emphasis for particular age groups may be on: physiological response to nutrient intake, improvement of nutritional status through informed consumer action; cultural, economic, and technological influences on food selection.
   - Environmental Factors: in design, space planning, housing, food service systems, clothing, and textiles as they relate to human needs. Emphasis may be on the impact of: cultural, sociological, psychological, and economic change; technological developments; aesthetics in improving the quality of the environment.
   - Consumers' Economic and Social Well-being: throughout the life cycle. Emphasis may be on: the relationship between family structure and decision-making processes in the use of human resources; the effects of social, macro- and microeconomics and political development on consumption patterns and other behavior; community programs to meet the socioeconomic needs of consumers.
3. Fifteen to 24 hours in cognitive or supporting courses (mainly from departments in other colleges in the University) including courses to give sufficient competence in statistics or research methods needed for dissertation research. Additional courses will complement the option emphasis and dissertation research area.

4. Doctoral research and dissertation will be based on a problem within the interdisciplinary option concentration.

Food Science Administration and Food Science with concentration in Food Systems Administration:

1. Three hours in research methods from Food Science 5510 or 5520 or Food Systems Administration 5210; 6 hours from Food Science 5610-30-40, 6110, Food Systems Administration 6110; and Zoology 5530 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.

Nutrition option:

1. Thirty hours of 5000 or 6000 courses in nutrition exclusive of research and Zoology 5530 or equivalent.
2. Nine hours in a collateral area (upon approval of student's faculty committee, 4000, 5000, and 6000 courses in collateral area beyond the 9 hours may be substituted for 5000 and 6000 courses in nutrition).
3. Minimum of 4 hours of credit in doctoral seminar.

SPECIAL WORKSHOPS

Workshops on special topics of current interest are offered periodically by the different departments in the College of Home Economics. These are of special interest to those desiring to work for advanced degrees. Announcements are sent upon request.

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. Students interested in a graduate program and/or the four-week courses should contact the Associate Dean of the College of Home Economics.

Professors:

H. B. Belcik (Dean), Ph.D. Michigan State; R. L. Nighberger (Ph.D., Iowa).

Associate Professors:


Assistant Professors:

M. F. Kalinowski, Ed.D. Massachusetts; P. Nowicki, M.S. M.S. Mango International; G. Peterson, Ph.D. Brigham Young; L. Southworth, E.D. Tennessee; S. Wardowski, Ph.D. Kansas.

4110 Student Teaching in Preschool Settings (6) Increasing responsibility for planning and guiding groups of young children under supervision of head teacher includes 2 hr weekly seminar. Prereq: 1500, 3210, 3300, 3530; 3960 recommended. E

4210 Family Finance (3) Analysis of alternative ways of meeting financial problems encountered during life cycle of family. E

4220 Conserving Time and Energy in the Home (3) Application of management principles to homemaking 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 throughout the life span and aged years. Prereq: 2110 or Home Economics 1510 or equivalent background in adult development or consent of instructor.

4350 Advanced Child Development (3) Survey of selected theories relevant to child development with emphasis on research literature and research methodology. Prereq: 4 hrs psychology and 6 hrs child development or equivalent. W

4420 Learning Experiences with Parents (3) Dynamics of parent-child 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: 2110. W

4430 Family Relationships (3) Interpersonal relationships among family members and societal roles. Prereq: 3510 or 3515. S

4510 Child in the Community (3) Needs of children; community agencies meeting these needs; visits to agencies contributing to the welfare of children. Prereq: 2110 or Home Economics 1510 or equivalent. W

4520 Administration of Programs for Young Children (3) Managing, planning, housing, feeding, scheduling, and financing for day care of infants and young children, nursery school programs, and special emphasis programs for deprived preschool children. Prereq: 3355 or 4110.

4630 Field Work in Child, Family and Consumer Studies (1-15) Opportunity for students to work in nursery schools or community agencies; focus on children, families, and/or consumer concerns. Hrs arranged. Prereq: Consent of instructor. May be repeated. Maximum 15 hrs. S/NC only. E

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 3.

4810 Afro-American Families (3) Historical background, contemporary family structure and relationships; emerging needs and programs. Prereq: 4 hrs in social sciences.

4830 Consumers and the Market (3) Analysis of elements in marketplace which create problems for consumers. Special attention is given to consumer decision-making, marketing, and consumer problems and opportunities associated with government protection of consumers. Prereq: Economics 2110. W, Sp

5000 Thesis (1-15) E

Departments of Instruction

Child and Family Studies

MAJORS

Child and Family Studies

Consumer Studies

Housing: Public Policy

Home Economics

DEGREES

M.S.

M.S.

Ph.D.
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. S/N only. E, W
5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions to problems in consumer studies. Prereq: Consent of instructor. E, W
5110 Field Work in Family Life (3) School and community programs concerned with education for family living. Prereq: Consent of instructor. May be repeated once. Maximum 9 hrs. W
5140 Consumption and Standards of Living (3) Economic and welfare aspects of consumption. Analysis of factors associated with changes in the standard of living. Review of major consumption studies. Prereq: 4830 or 5170 or consent of instructor. E
5150 Assessment of Family Behavior (3) Methods of measurement related to study of family. Current methodological issues. Prereq: 5410 or 5630 or consent of instructor.
5170 Consumer Economics (3) Consumer functions in economy; structure of consumer markets; government action relating to consumers; factors affecting prices of consumer goods.
5180 Family Financial Consultation (3) Analysis of family expenditure patterns, common financial difficulties, avenues by which families are assisted. Field experience in consumer consulting services. Prereq. 4210, 4830 or 5170. Sp
5190 Standards in Consumer Protection (3) Product and performance standards in consumer protection and control of consumer goods. W
5210 Theories of Child Development (3) Prereq: 3 hrs sociology, 2 hrs and 1 lab.
5220 Family Life Programs (3) School and community programs in family life, survey and evaluation. Students concentrate on type best suited to their experience and future professional orientation. Prereq: 3 hrs child development, 3 hrs family relationships, 3 hrs sociology. 2 hrs and 1 lab.
5301 Theory and Research on Human Sexuality (3) Cultural, social, and psychological dimensions of human sex. Emphasis on historical contributions of anthropology, sociological, and personality theory and research. W
5410 Advanced Family Relationships (3) Problems in modern family life, individual adjustments, group relationships. Prereq: 3515, 4430, or consent of instructor.
5420 Parents and Children (3) Common problems of young children faced by parents and teachers; emphasis on methods available to modify problem behavior.
5430 Families in Crisis (3) Interpersonal transactions in disordered family behavior. Prereq: 5410 or equivalent. W
5510 Survey of Research in Child and Family Studies (3) Research literature; locating, abstracting, and evaluating research studies. Prereq: 3515 or 4430 or consent of instructor. W
5530 Research Methods in Child and Family Studies (4) Research procedures in child and family behavior; methodology of behavioral sciences. Recommended as prerequisite to beginning thesis work in this area. Prereq: 9 hrs child and family studies, 1 2-hr lab.
5540 Learning in Preschool Programs (3) Description, analysis, and evaluation of various preschool models and programs. Prereq: 8 hrs in child and family studies and 1 2-hr lab.
5550 Supervision in Preschool Programs (3) Guidance of students working in nursery school and day care centers. Guiding students through seminar discussion, individual conferences, and various adult evaluation techniques. Prereq: 3540, 3 hrs and 1 2-hr lab.
5560 Theories of Management in the Family Environment (3) Fundamental management concepts, development and application to current family situations.
5580 Nursery School Administration (3) Organization and operating schools and play groups for preschool children. Staff, schedules, programs, financing. Prereq: 4110 or equivalent. W
5630 Seminar in Infant Development (3) Theory and research relating to development during infancy. Prereq: Consent of instructor. W
5640 Teaching Child and Family Studies (6) Seminar and practicum in techniques for teaching child development and family relationships. Prereq: Consent of instructor. S/N only. E, W
5800 Problems in Child, Family and Consumer Studies (1-3) Advanced study of child development and family relationships. Prereq: 18 credit hours in planned parenthood programs and clinic. May be repeated. Maximum 9 hrs.
5850 Children's Effects on Parents and Marriage (3) Theoretical and research about how children change parents and influence marital relationships. Prereq: 4430 or consent of instructor.
5900 Seminar in Child and Family Studies (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.
6250 Advanced Topics (3) Individual study and group discussion of current problems. Prereq: Consent of instructor. S/N only. Maximum 9 hrs.
6310 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: 6 hrs advanced child and family studies, 4 hrs nutrition, 4 hrs physiology, or equivalent. Sp
6320 Individual and Family Development: Cognition (3) Processes through which human individuals learn to recognize their world. Cognitive processes involved in development across life span, focus on research findings and methodology. Prereq: 5210, 5530, 5630, 6540, 6640 or equivalent. Sp
6330 Individual and Family Development: Socialization (3) Processes of socialization throughout life cycle. Family as primary socializing agent. Prereq: 5210, 5410, or equivalent.
6410 Theory Construction in Family Studies (3) Process and application of theory construction in contemporary research areas and family studies. Emphasis on understanding, criticizing and constructing theoretical models based on research findings. Prereq: 5410 or consent of instructor.
6450 Conceptual Frameworks for the Family (3) Theoretical models of understanding families. Exploration and applications of frameworks on theoretical and research levels. Historical to contemporary development of family studies. Prereq: 5410 or consent of instructor. Sp
6540 Seminar in Programs for Infants and Preschool Children (3) Research related to programs for infants and young children. Prereq: 4830 or 5170. May be repeated. Maximum 9 hrs.
6610-20 Applied Behavior Analysis in Natural Settings (3, 3) Individual supervision in application of applied behavior analysis in natural settings. Prereq: 5420 or consent of instructor.
6710 Elements of Consumer Choice (3) Analysis of consumer decision making, theory of consumer behavior, impact of affluence on consumer legislation, consideration of dynamic aspects of consumer behavior, including roles of aspirations, expectations, utility, and information and instruction. Prereq: 5170 or consent of instructor. W
6720 Consumer Protection (3) Consumer protection, regulatory agencies, standards, information, consulting, and legislation. Assumptions involved in these efforts and relative success of different strategies. Prereq: 5170, 5180 or consent of instructor.

Food Science, Nutrition, and Food Systems Administration

MAJORS

DEGREES

Food Science, Nutrition, and Food Systems Administration

MAJORS

DEGREES

Food Science

M.S.

Nutrition

M.S.

Home Economics

Ph.D.

Professors:

R. E. Beauchene (Head), Ph.D. Kansas State; A. M. Campbell, Ph.D. Cornell; G. E. Goertz, Ph.D. Kansas State; M. J. Hinchcock, Ph.D. Kansas State; L. M. Odland, Ph.D. Wisconsin; D. W. Hubbard, Ph.D. Wisconsin; D. E. Lyon, M.S. Cornell; L. M. Tylor, Ph.D. Kansas State; L. M. Anderson, Ph.D. Wisconsin; J. D. Skinner, Ph.D. Oregon State.

Associate Professors:

B. L. Beach, Ph.D. Wisconsin; D. W. Hubbard, Ph.D. Wisconsin; J. R. Savage, Ph.D. Wisconsin; J. R. Savage, Ph.D. Wisconsin; L. W. Blanding, Ph.D. Wisconsin; L. M. Anderson, Ph.D. Wisconsin; G. W. Disney, Ph.D. Pennsylvania; A. M. Campbell, Ph.D. Cornell.

Assistant Professors:

F. E. Andrews, Ph.D. Ohio State; G. L. Blanding, Ph.D. Wisconsin; R. M. Broock, Ph.D. Wisconsin; M. S. Alabama; K. W. Disney, Ph.D. Pennsylvania; J. D. Skinner, Ph.D. Oregon State.

Food Science

4000 Origin of Food and Foodways (3) Food origin and development of individual and group foodways. Prereq: 8 hrs social science or humanities. F, W

4010 Introductory Experimental Food Science (3) Physical and sensory evaluation in experimentation with fats, high protein foods, and battery and dough systems. Prereq: 3510, 2 hrs and 1 lab. W, Sp

4020 Experimental Food Science (3) Individual experimentation and research in food chemistry and physics. Prereq: 4010. Nutrition 3320 recommended. 1 hr and 2 labs. Su, A

4040 Food in Contemporary Society (3) Consumer's responsibilities and potential influence with respect to food supply. F, W

4100 Food Preservation (3) Application of basic principles and research finding to food preservation in home. Prereq: 1010, 4 hrs microbiology, and Nutrition 3310 or equivalent. 2 hrs and 1 lab. F

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E, W, Sp

5140 Foods and Nutrition: Physiological Principles (3) Thermodynamics; physicochemical properties of proteins, carbohydrates and lipids; chemistry of colloid state; chemical kinetics: specialized kinetics of enzymatic processes. Prereq: Nutrition 3350 and Mathematics 1540 or equivalent. Sp

5510 Food Technology (3) Classification of foods according to textural parameters; instrumentation in measurement of texture. Prereq: 4610 or Food Technology 4920. Plant and Soil Science 3610 or equivalent; or consent of instructor. W

5620 Food Sensory Testing Methods (3) Principles and methodology of sensory evaluation of food; application of methods; analysis of sensory data. Prereq: 5640.
5530 Advanced Experimental Food Science (3) Application of basic principles and research findings to individual problems. Prereq: 5510-20 or consent of instructor. Su, A.

5550 Food Behavior of the Individual (3) Development of and changes in choices of food and food habits of individuals. Prereq: 4010; 3 hrs of nutrition, or consent of instructor. Sp, Su.

5560 Foodways in the United States (3) Current foodways of selected subcultures in United States and historical basis for their development. Prereq: 4000; 3 hrs of nutrition, or consent of instructor. W, Sp.

5610-20 Advanced Food Science (3, 3) Biochemical and biophysical interactions in food. Prereq: 4010; Nutrition 3320 or equivalent, or consent of instructor. W, Sp.

5630 Carbohydrates and Fats in Relation to Food Science (3) Physical and chemical characteristics of the proteins of sugar, starches, fats and fats with emphasis on their behavior in food. Prereq: 4010; Nutrition 3320-30 or equivalent.

5640 Proteins in Relation to Food Science (3) Physical and chemical characteristics of the proteins of milk, eggs, flour, and meat with emphasis on their behavior in food. Prereq: 4010; Nutrition 3320-30 or equivalent.

5700 Current Programs and Trends in Food Science (1-3) Recent advances in food science, impact on curricular considerations, and implications for teaching methods, extension workers, and dietitians. Prereq: Consent of instructor. May be repeated.

5800 Problems in Food Science (1-3) Advanced study from field of food science. Prereq: Consent of department head and professor in charge of investigation. May be repeated.

5850 Field Experience (3-9) Experience in food-related industry or agency under supervision of faculty member. Prereq: Consent of instructor.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110 Advanced Topics in Food Science (3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: Consent of instructor may be repeated.

6120 Food Dispersions (3) Physical characteristics of solutions, colloidal dispersions and suspensions in relation to treatments applied. Prereq: 5530.

6130 Lipid Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20.

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20, A.

6150 Food and Sociocultural Change (3, 3) Critical evaluation of factors and interrelationships affecting food intake and consumption patterns. Must be taken in sequence. Prereq: 5530 or 5630, or consent of instructor. F, W.

6900 Seminar (1-3) May be repeated. S/NC only.

Nutrition

3310 Organic Chemistry (4) Emphasis on subjects leading to 3130-30, Textiles and Clothing 4220. Prereq: General Chemistry. 3 hrs and 1 lab. Not for graduate credit to departmental majors. F, Sp.

3320 Food Analysis (4) Elementary quantitative analysis and interpretation of basic principles and research findings to good nutrition for children, adolescents and adults. Prereq: 3020, 3050, or 3410. 2 hrs and 1 lab.

3410 Nutrition in Disease (3) Nutrition problems and services in the community; supervised field experiences are integral part of the course. Prereq: 3020, 3050, or 3410. 3 hrs and 1 lab.

4110 Introduction to Nutrition Research (3) Discussion of principles and laboratory experiences. Prereq: 3410 or equivalent. 2 hrs and 1 lab.


4231 Clinical Experiences in Dietetics (1) Planned clinical experiences applying principles of nutrition in disease. Coreq: 4230.

4240 Nutrition in Disease II (3) Interdisciplinary lectures and discussions on the metabolic processes of normal and diseased organs and/or tissues and the dietary or behavior modifications required. Prereq: 3410 or consent of instructor. W.

5000 Thesis (1-15) E

5020 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: 3410-30 or equivalent. E

5110 Advanced Physiological Chemistry (4) Bioenergetics and related metabolism of nutrients. Prereq: 3330 or equivalent. 3 hrs and 1 lab. F.

5120 Advanced Physiological Chemistry (3) Nutritional factors in relation to body fluids, gas transport, and endocrine function. Prereq: 3330. W.


5210 Advanced Nutrition (3) Critical review of fundamentals. Prereq: 3330, 4140. F.

5230 Experimental Methods in Nutrition (3) Use of small animals in experimental nutrition. Prereq: 3320-30, 3410. 2 hrs and 1 lab.


5310 Community Nutrition (3) Nutrition problems and practices in community; supervised field work. Prereq: 3410 and consent of instructor. 3 labs. F.

5320 Community Nutrition (3) Observations and participation in nutrition programs of local and state agencies. Prereq: 5310 and consent of instructor. 3 labs. W.

5330 Community Nutrition (3) Nutrition programs of state and federal agencies; preparation of material for nutrition education; supervised field work. Prereq: Consent of instructor. 3 labs.

5340 Field Study in Community Nutrition (1-12) Personal participation in and analysis of state or regional community nutrition program. Location of in-depth study to be selected in consultation with instructor. Prereq: 3320 and consent of instructor. S/NC only. F.

5350 Mental Retardation or Other Developmental Disabilities (1-12) Interdisciplinary lectures and discussions. Prereq: 5410-20. Sp, A.

5470 Nutrition and Aging (3) Nutritional problems of aging individuals; dietary requirements, dietary intake, and effect of nutrition on rate of biological aging. Prereq: 5210 or consent of instructor. W.

5510 Nutrition in Mental Retardation and Developmental Disorders (1-12) Interdisciplinary diagnosis and treatment of developmentally handicapped child. Involves clinical experience and lectures at Child Development Center, Center for the Health Sciences, Memphis. Prereq: Consent of department head. F.


5800 Problems in Nutrition (1-3) Advanced study selected from field of nutrition. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110 Advanced Topics in Food Science (3) Comprehensive individual study and group discussion of topics related to current problems in food science. Prereq: Consent of instructor may be repeated.

6140 Vitamin Metabolism (3) Lectures, reports, and discussions. Prereq: 5410-20, A.

6150 Food and Sociocultural Change (3, 3) Critical evaluation of factors and interrelationships affecting food intake and consumption patterns. Must be taken in sequence. Prereq: 5530 or 5630, or consent of instructor. F, W.

6900 Seminar (1-3) May be repeated. Maximum 9 hrs. S/NC only.

Food Systems Administration

4130 Food Systems Administration (3) Functions of management applied to food service systems. Prereq: 3110. F.

4140 Food Systems Personnel Development (3) Development of training programs for food systems personnel. Prereq: 4130 or consent of instructor. W.

4150 Design and Layout of Food Service Systems (3) Design of physical facilities and selection and purchasing of equipment for food service systems. Prereq: 3110 or consent of instructor. W.

4250 Food and Lodging Managerial Cost Control (3) Cost analysis for control. Use of financial statements for decision making for food and lodging systems. Prereq: 4240 or consent of instructor. W.

4250 Food and Lodging Physical Plant, Planning and Maintenance (4) Feasibility, planning, development and construction of food and lodging systems.
physical plant and maintenance. Electrical, mechanical, heating, plumbing, air conditioning and ventilation and illumination systems. Types of building materials and construction. Prereq: 3110, 4150 or consent of instructor. 3 hrs and 1 lab. W

4270 Tourism, Food and Lodging Information Systems (3) Qualitative and quantitative analysis of information systems, decision making in food and lodging operations or other operations related to the tourism industry. Prereq: 4130, 4280, Computer Science 1410. A

5000 Thesis (1-15) E

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

5110-20 Experimental Quantity Food Study (3, 3) Analysis of food production, holds, environment, and service problems related to quality of food prepared in volume. Management resources. Prereq: 4130, 3110, or consent of instructor. Su, A

5210 Methods of Food Systems Research (3) Research methods applicable to food systems administration. Prereq: 4130, Statistics 5211 or equivalent. W

5220 Experimental Design of Food System Facilities (3) Environment in which food is prepared, held, and served in volume. Prereq: 4150. Su

5230 Food Systems Evaluation (3) Management resources. Standards for control. Prereq: 4130, or consent of instructor. F


5310 Administration of Food Service Delivery Systems (3) Roles and responsibilities of administrator in maintaining desired qualitative and quantitative standards in food system. Prereq: 3110 or consent of instructor. W

5500 Clinical Training in Health Care Agencies (3) Instructional and supervisory techniques in clinical settings for students in food service. Prereq: 4760 or consent of instructor. A

5700 Current Programs and Trends in Human Resource Development (1-3) Comprehensive individual study and group discussion of current problems in food systems administration and implications for dietitians, school food service directors, and others in related fields. Prereq: Consent of instructor. May be repeated. W

5800 Problems in Food Systems Administration (1-3) May be repeated.

5850 Field Experience (3-9) Planned administrative experience in food service system. Prereq: Consent of instructor.

5900 Seminar (1-3) Prereq: Consent of instructor. May be repeated. Maximum 3 hrs. S/NC only.

6110 Advanced Topics in Food Systems Administration (3) Comprehensive individual study and group discussion of current problems in food systems administration. Prereq: Consent of instructor.

6210 Manpower Planning and Training for the Food Service Industry (3) Identification of manpower needs by skill levels; programs for personnel in food service industry. Prereq: 4140, 5210 or consent of instructor. Sp

6310 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. Taken in conjunction with credit for 6310 contingent upon completion of 6320. Su

6900 Seminar (1-3) May be repeated. S/NC only. E

Home Economics

MAJOR Home Economics

DEGREE M.S.

5900 Practicum (1-12) Field experience in selected organizations that focus on interdisciplinary solutions to multilevel problems of society. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

5100 International Studies (1-15) Student- or staff-initiated course for study in foreign country of topic(s) pertinent to field. Topic to be determined by student and instructor with department and college approval. May be repeated. Maximum 15 hrs.

5210 History and Philosophy of Home Economics (3) Historical development of home economics; survey of concepts and philosophy of component disciplines and analysis of current programs; emphasis on projection of future developments.

5220 Development of Community Services Programs (3)

5230 Evaluation of Community Services Programs (3) Purposes of evaluation, clarification of objectives and procedures for determining progress.

5000 Home Economics in the Community (3) Role of home economics programs and how interactions among professionals of all community resources facilitate finding solutions for and/or solving problems of individuals, families, and communities related to quality of life. Prereq: Agricultural Economics 4320 or Economics 5340 or Planning 4110 and Family Studies 5700 or consent of instructor.


5800 Problems in Community Services (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5900 Seminar in Human Resource Development (1-3) May be repeated. S/NC only.

6000 Doctoral Research and Dissertation (3-15) E

6110-20 Theoretical Issues in Human Resource Development (3, 3) Interdisciplinary approach to development of human resources in solution of family and consumer problems. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics, or consent of instructor. F

6210 Professional Issues in Human Resource Development (3) Role and philosophy, and administrative procedures for human resource development. Prereq: 12 hrs of 5000-level courses representing 2 areas of home economics.

6310 Advanced Topics (3) Comprehensive individual study and group discussion of individual and family behavior, physiological development, well-being, environmental factors, and economic and social well-being. Prereq: 6110. May be repeated.

6500 Methodological Issues in Home Economics (3) Advanced methodology in home economics, interdisciplinary research methods and issues. Prereq: 1 graduate-level course in research methodology or consent of instructor.

6900 Seminar (1-3) May be repeated. S/NC only.

Home Economics Education

Graduate study in home economics education provides for an M.S. in Vocational-Technical Education (concentration in home economics education) and opportunity for participation in the Ed.D. program in Vocational-Technical Education in the College of Education. (See page 61 for staff and course offerings.)
rinals; search for aesthetic potential in depth.

5060 Practicum (1-12) Field experience in selected agencies and organizations that focus on solutions in problems in housing.

5120 Historic Interior Design (3) Research studies of historic interiors. Examples may range from prehistoric dwellings to modern designs. Variable course content, emphasis on interior design, furniture and/or accessories for England, Scandinavia, Mediterranea, and the Americas. May be repeated. Maximum 18 hrs.

5210 Furniture Appreciation (3) Aesthetic qualities of past and present styles. Significant structural and formal characteristics of various furniture forms.

5310 Interior Design (3) Advanced problems in planning and design of interior space; application 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 ecological, psychological, 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 study of 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 by 2-3member teams. Prereq: 6 hrs behavioral science, and 6 hrs natural science or consent of instructor.

5610 Furniture Design (3) Analysis of human factors data in design of body support, task support, and storage furniture pieces and systems; production of concept drawings, prototypes and scale models. Prereq: Consent of Instructor. Sp

5613 Housing Management (3) Role and functions of housing management specialist in problems of private and assisted housing management. Prereq: 4320 or consent of instructor.

5614 Housing Regulations and Controls (3) Function of regulations and other control practices and mechanisms as determinants of nature, availability of housing in local communities by various user groups. Prereq: 4320 or consent of instructor.

5615 Housing Programs and Policies (3) Analysis of private and public programs in housing policy; realization of housing needs and living environments for families. Economic and social problems related to national housing objectives. Prereq: 4320 or consent of instructor.

5620 Experimental Methods in Household Equipment (3) Research methods and techniques in determining performance of household equipment. Prereq: 2430 or consent of instructor. 1 hr and 2 labs.

5630 Environmental Requirements for Family Work Centers (3) Trend in planning work centers such as kitchens and laundries; adequacy, convenience, convenience, surface treatment, facilities and costs; problems of installation and remodeling.

5815 Environmental Design Research (1-3) Evaluation and application of research methodologies to interior design problems. Hours and credit arranged. Prereq: 5810-20-30 or equivalent and consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

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.

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.

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 current issues and problems related to housing. Prereq: Consent of instructor.

6120 Advanced Topics in Housing Research (3) Various concepts, theories and methodologies of social science as applied to housing research. Prereq: Consent of instructor.

6210 Environmental Design Analysis (3) Advanced methodology in psychobiology of environmental design, multidisciplinary research data and methods. Prereq: 5510-20-30.

6420 Perspectives in Interior Design (3) Historical influences related to contemporary concepts in interior design. Prereq: 5040, 6 hrs of graduate level art history, or consent of instructor.

Textiles and Clothing

MAJORS

Textiles and Clothing

Home Economics

Associate Professors:

B. C. Goswami, I. M. Ford, T. L. Vigo, MAJORS

Textiles and Clothing

T. L. Vigo, Ph.D. Tulane.

Ph.D. Pennsylvania State; Ph.D. Tennessee; L. A. Kocher, Ph.D. California (Davis).

4210 Elementary Textile Microscopy (3) Microscopic techniques as applied to the study of textile fibers and fabrics. Prereq: 4040. 1 hr and 2 labs. W, A

4240 Design Analysis II (3) Interpretation of dress design terminating in finished garments developed through the media of draping.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. Maximum 9 hrs.

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 (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 served. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

5200 Advanced Textiles (1-3) Advanced study selected from field of textiles and clothing. Prereq: Consent of department head and professor in charge of investigation. May be repeated. Maximum 9 hrs.

5290 Seminar in Textiles and Clothing (1-3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs. W


6110 Selected Issues in Textiles and Clothing (3) Advanced topics of current significance. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

6140 Selected Behavioral Theories in Clothing (3) Role of clothing in functioning of people, utilizing behavioral theories. Prereq: 5170, 6 hrs of graduate liberal sociology or psychology, or consent of instructor.

6150 Social-Psychological Theories of Clothing Consumerism (3) Analysis and evaluation of social science theories of consumer behavior in relation to textiles and apparel. Prereq: Child and Family Studies 5170. 8 hrs of graduate level sociology or psychology, or consent of instructor.

6160 Textile Flammability (3) Factors affecting textile flammability as consumer issue. Standards, regulations, test methods, economic impact. Prereq: 5120, 5190, 5250, or consent of instructor.

6710 Physical Performance Behavior of Textile Structures I (3) Fundamentals of yarns and fabric structures; relationship of structure to physical characteristics of textile materials. Prereq: 5120, or consent of instructor.

6910 Seminar in Textiles and Clothing (1-3) May be repeated. Maximum 6 hrs.
Intercollegiate Programs

Aviation Systems

MAJOR
Aviation Systems

DEGREE
M.S.

Lead Professor:
M. A. Wright, Ph.D. Wales.

Professors:
W. Frost, Ph.D. Washington; W. F. Jacobs, Ph.D. Roostingen (Germany); A. A. Mason, Ph.D. Tennessee; J. M. Wu, Ph.D. California Institute of Technology; R. L. Young, Ph.D. Northwestern.

Associate Professors:
F. G. Collins, Ph.D. California (Berkeley); R. D. Kimberlin, M.S. Tennessee; J. R. Mau, Ph.D. North Carolina State.

Assistant Professors:
W. B. Baker, Jr., Ph.D. Tennessee; W. J. Boaz, M.S. Florida State; V. K. Smith, Ill., 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 as represented by Computer Science 3150 or equivalent, a background in accounting as represented by Accounting 5030 or equivalent basic accounting courses, a basic knowledge of economics as represented by 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, 6 quarter hours in Industrial Engineering 5700 and 5710; for the administration area, 6 quarter hours in Economics 5030 and Accounting 5810, for a total of 12 quarter hours.
3. 6 hours of electives selected from the major field, engineering and/or the areas in item 2.
4. 9 hours in Aviation Systems 5000, Thesis, hence demonstrating the ability to conduct and report on an independent investigation.

The non-thesis program will be permitted in special circumstances and involves satisfactory completion of the following minimum requirements:
1. 18 hours in the major field of aviation systems.
2. For the research and development area, 9 quarter hours in Industrial Engineering 5700, 5710, and 5720; for the administration area, 9 quarter hours in Economics 5030, Accounting 5810 and Finance 5010-20, for a total of 18 quarter hours.
3. 6 hours of electives in one of the areas in item 2.
4. 6 hours of electives in the major field, engineering and/or the areas of item 2.
5. Satisfactory completion of 3 quarter hours in Aviation Systems 5100, Project in Aviation Systems.
6. Satisfactory completion of a comprehensive final written examination on all course work submitted for the degree and defense of the project course paper.

The thesis program involves 45 quarter-hour credits minimum while the non-thesis program involves 51 quarter-hour credits minimum.

Courses suitable for credit in the major field include: Aerospace Engineering 5810 and 5820, Industrial Engineering 5840; Aviation Systems 5070, 5080, 5090, 5210, 5220, and 5910.

Electives typical of those suitable for credit in the area of aviation systems, research and development include: Aerospace Engineering 5150-60-70; Computer Science 3510-20, 4550 and 5655-65-75; Industrial Engineering 4060, 4150, 4230, 5720, 5730, 6700, 6730; Mathematics 4225-35-45, 4510-20-30; Metallurgical Engineering 5810-20-30; and Statistics 3450.

Electives typical of those suitable for credit in the area of aviation systems, administration include: Accounting 5020, Business Law 5010; Economics 5020, Management 5130; Marketing 5010-20; Transportation 5050, 5130, 5210-20, and 5910.

5000 Thesis (1-15) E

5070 Airports and the Community (3) Structure of airports and their communities. Technology and economics of cargo, baggage, ticket 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: Aerospace Engineering 5810.

5080 Collection and Distribution (3) Capabilities, technology, plans, programs and developments for collecting and distributing passengers and freight to and from various types of airports. Ground, water, air and mixed transportation modes, present and future; requirements analysis, and model analysis of the system. Prereq: Aerospace Engineering 5810.

5090 Governmental Policies for Aviation (3) Theoretical and legal basis for economic and governmental regulation of aviation. Historical and legislative development of aviation regulatory agencies, organizational structure and administrative and enforcement procedures. Prereq: Aerospace Engineering 5810.

5100 Project in Aviation Systems (3) In-depth study and formal report on aviation systems topic, normally performed during last quarter of work toward degree in non-thesis program. For aviation systems degree candidates only.

5210-20 Experimental Flight Mechanics (3, 3) Flight mechanics, experimental techniques. Specially-equipped airborne laboratory allows active student
participation in series of experiments demonstrating acquisition of flight test data. Tests conducted covering broad range of aircraft performance, stability, and control characteristics. Development of theory necessary to support class experiments, test techniques, and course reduction methods. 5210 emphasizes performance; 5220 emphasizes stability and control. Prerequisite: Aerospace Engineering 5210.

5970 Special Topics in Aviation Systems (3) Current problems in aviation systems. Prerequisite: Consent of instructor. May be repeated with consent. See also course descriptions in Aerospace Engineering 5810, 5820, and Industrial Engineering 5840.

Ecology

MAJOR

EGO

M.S., Ph.D.

J. Frank McCormick, Director, Ph.D. Emory

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 and the Tennessee Valley Authority provide advisors and research facilities. The Great Smoky Mountains, Cumberland Plateau, valley and ridge topography, TVA lakes and wild rivers provide locally a spectrum of natural habitats and consequent biological diversity which is truly unique. In addition, faculty research programs provide opportunities for student research elsewhere on this continent and abroad.

ADMISSION REQUIREMENTS

Requirements for admission to this program are: (1) admission to the Graduate School; (2) at least 12 quarter hours of college chemistry, 9 quarter hours of college mathematics, and 4 quarter hours of ecology at the upper division level; (3) departmental application and 3 rating forms; (4) the Graduate Record Examination.

Application forms for admission should be obtained from the Graduate School. Inquiries concerning the admission requirements should be addressed to the Director, Graduate Program in Ecology, University of Tennessee, Knoxville, Tennessee 37916.

ADVISORS

Advisors are selected from ecologists in several departments of the University who have competence in the area in which the student expects to work. Entering students should consult early with the Director of the program on the choice of a faculty advisor who will become the chairperson of the student's faculty committee.

THE MASTER'S PROGRAM

The minimum 45 quarter hours of graduate credit shall include 18 hours of ecology courses (exclusive of thesis), of which 8 hours shall be in Ecology 5210-20-30 and at least 8 additional hours in ecology courses numbered above 6000. 9 hours of thesis in Ecology 5000, and 18 additional hours in an ecology or supporting courses. To insure an interdepartmental program, the required minimum 45 hours shall include no more than 18 hours of non-thesis courses from any one department of instruction. The general requirements for this Master's degree are listed on page 9.

A minor in ecology shall include Ecology 5210-20-30 (6 hours) and at least 3 additional hours in approved ecology courses.

THE DOCTORAL PROGRAM

The requirements for this degree are in general the same as those of the Graduate School with the following two exceptions: (1) each student's faculty committee shall consist of at least two members from the department in which the dissertation is being supervised; (2) at least two from outside this department. (2) This dissertation program must include Ecology 5210-20-30 and a minimum of 9 quarter hours of courses numbered above 6000. A student cannot enroll for dissertation until the research proposal has been discussed and approved by the doctoral committee.

Shared Faculty


Courses

The following courses are those offered directly by the Ecology Program and those, which although listed in other departments, have been approved to satisfy Master's degree requirements. Additional ecology courses are described elsewhere in the catalog under the departments identified in the following list.

Agricultural Biology

4010 Biology of Soil Microorganisms (4)

Agricultural Economics and Rural Sociology

4330 Land Economics (3)

5420 Advanced Land Economics (3)

Anthropology

4360 Field Work in Physical Anthropology (3-9)

4640 Zoolarcheology (3)

4960 Primate Paleontology (3)

4970 Human Paleontology (4)

5970 Emergence and Early Evolution of Man (3)

Botany

4510 Plant Ecology (4)

5340 Plant Geography (4)

5350 Analysis of Plant Communities (4)

5510-20-30 Systems Ecology (3, 3, 3)

5830 Field Methods in Plant Ecology (4)

6320 Ecosystems of the World (3)

5000 Thesis (1-15) E

5100 Special Problems in Ecology (1-3) Individual investigations in ecology. May be repeated with consent of instructor. Maximum 3 hrs.

5210-20-30 Principles of Ecology (2, 2, 2) Theories and problems in ecology. Comparisons between land, freshwater, and marine environments, including humanity's role in the world's ecosystems. Must be taken in sequence. Prerequisite: 4 hrs of ecology at the upper division level.

5310 Ecology for Planners and Engineers (3) Ecological principles and effects that human-caused changes have on living organisms. Lectures and field trips. For students in Graduate School of Planning and Environmental Engineering.

5320 Implementation of Environmental Policy (3) Goals and problems of environmental legislation, especially National Environmental Policy Act; purpose, preparation, and evaluation of environmental impact statements and similar multidisciplinary studies. Prerequisite: 5210 or 5310, or Environmental Engineering 4820.

5610 Environmental Toxicology (3) (Same as Biochemistry 5610.)

5640 Techniques in Environmental Toxicology (2) (Same as Biochemistry 5640.)

6000 Doctoral Research and Dissertation (3-15) E

6100 Special Topics in Ecology (3) Seminars on advanced topics and recent developments in ecology. Prerequisite: Consent of instructor. May be repeated.

6110 Seminar in Animal Behavior (2)

6120 Seminar in Aquatic Ecology (2)

6130 Seminar in Physiological Ecology (2)

6140 Seminar in Community Ecology (2)

6150 Seminar in Radiation Ecology (2)

6160 Seminar in Systems Ecology (2)

6431 Current Topics in Environmental Toxicology (1) (Same as Biochemistry 6431.)

Economics

4260 Economics of Resources and Environmental Policies (3)

Environmental Engineering

4530 Sanitary Engineering Laboratory (3)

4600 Solid Waste Management (3)

4700 Air Pollution-Air Resources Management (3)

5593 Advanced Sanitary Engineering Laboratory (3)

5700 Planning and Air Pollution Control (3)

5710 Air Pollution Control Engineering (3)
The Master's and doctoral programs are offered jointly by the Department of Psychology and the Department of Management. They are designed to prepare students for personnel, managerial, and organizational research, for university teaching, and for consulting relationships with industry. The emphasis is upon applied research utilizing a thorough theoretical background, including classical and modern organization theory, organizational behavior, psychology, and management. The programs are administered by a joint committee of the two departments, appointed by the Vice Chancellor for Graduate Studies and Research on recommendations from the two department heads.

It is intended that students entering the program will represent widely different undergraduate and graduate backgrounds including psychology, business administration, engineering, science, and liberal arts. The first-year program provides the opportunity to take courses which will assist the student to attain a reasonable level of sophistication in areas of deficiency.

ADMISSION PROCEDURE

Applicants for admission should request forms and materials from both the Graduate Office and the Chairperson, Industrial and Organizational Psychology Program, 413 Stokely Center for Management Studies. Two separate applications must be completed: one application for admission to the Graduate School and one application for admission to the Industrial and Organizational Psychology program.

Deadline: For fall entrance, all materials should be received by the Vice Chancellor for Graduate Studies and Research no later than March 1 if you wish financial assistance consideration. 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 the Graduate Management Admission Test or on each section of the aptitude portion of the GRE are preferred. Customarily, those students admitted to the Program have performed at or above the 63rd to 85th percentile on each portion of these tests. (This corresponds to a raw score of approximately 500 on each of the tests.) The advanced section for psychology (GRE 81) is required of all applicants regardless of whether their scholastic aptitude is assessed with the GRE or GMAT.

THE MASTER'S PROGRAM

I. Course Requirements
A. Management or Psychology 5170, 5180, 5190.
B. Statistics 5050-60-70 and 3 hours of applied psychometrics.
C. Eighteen hours of additional course work to be selected primarily from among the 5000-level seminars in management and psychology (e.g., Management 5110, 5120, 5220, 5230).
D. Nine hours of Psychology or Management 5000 (Master's Thesis).

II. Program Requirements

The Ph.D. program requirements described below in sections II A, II B, and II G comprise the major requirements for a Master's degree.

An oral examination covering the thesis and related topics must also be completed.

THE DOCTORAL PROGRAM

I. Course Requirements
A. Minimum core requirements:
   1. Management or Psychology 5170, 5180, 5190.
   3. Minimum of three 8000-level seminars to be selected from Psychology or Management 6250, 6260, 6270, and Management or Psychology 6380.
   4. 36 hours of Psychology or Management 6000.
B. Recommended electives:
   1. For preparation for advanced section (81) GRE: Psychology courses as appropriate.
   2. For students who require preparation in psychometrics: Applied psychometrics.
   3. For students who require preparation in management: Management 5110, 5120, 5220, 5230.
   4. For students who wish to pursue special research interests aside from their dissertation: Management 5250, 5260, 5270, Management or Psychology 6900.
   5. Courses available in areas related to industrial and organizational psychology:
      a. Through College of Business Administration;
      b. Through College of Liberal Arts;
      c. Others as approved by advisor.
   II. Program Requirements**
A. Attainment of a B average*** in Management or Psychology 5170, 5180, 5190.
B. Completion of a comprehensive examination in general psychology within no more than two years of entry by attaining a score of 650 on the GRE Advanced Test in Psychology.
C. Completion of a general preliminary examination in scientific methodology before beginning the third year of study. This examination covers the following specific areas: statistics, psychometrics, experimental design.
D. Completion of a special preliminary 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.
E. By the end of nine quarters a student is expected to choose a major advisor (Chairperson of Doctoral Committee).
F. 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.
G. Maintenance of at least 3.0 grade point average.

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*May be repeated for additional credit.
**Any student in the doctoral program may be required to prepare a Master's thesis by the Industrial and Organizational Psychology Committee. This policy will be implemented by the committee at such time as a review of the student's record suggests that additional data on the qualifications for pursuing a Ph.D. are required.
***See program handbook for definition of a B average.
Management Science

MAJOR: Management Science

DEGREE: M.S.

Committee:
C. E. Bell (Chairperson), Management Science; R. W. Boling, Management; J. S. Bradley, Mathematics; R. L. Church, Civil Engineering; R. S. Garfinkel, Management Science; E. Giustof, Economics; R. E. Rosenhal, Management Science; S. Selkow, Computer Science; R. E. Shrieves, Finance; C. C. Thigpen, Statistics.

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 allows concentrated study in an area of application within the College of Business Administration. With the wide-spread application of management science technology, the student may (with the approval of the Management Science Committee) choose an applied concentration in a field outside the College of Business Administration.

Applications are encouraged from all majors, but mathematics background equivalent to the completion of at least two years of college calculus and proficiency in a computer language (e.g. Computer Science 3150) is required. The program is designed to be completed in one calendar year of full-time study, but applications are also encouraged from prospective part-time students.

Course Requirements

<table>
<thead>
<tr>
<th>Course Area</th>
<th>Quarter Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Science 5310-20-30-35-40</td>
<td>14</td>
</tr>
<tr>
<td>Applied concentration area</td>
<td>(approved by advisor)</td>
</tr>
<tr>
<td>Statistics 5110</td>
<td>3</td>
</tr>
<tr>
<td>Statistics elective (5000 level or above)</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics (4000 level or above)</td>
<td>6</td>
</tr>
<tr>
<td>Electives selected from mathematics, statistics, computer science, and/or management science</td>
<td>6</td>
</tr>
<tr>
<td>Electives in any area approved by advisor</td>
<td>6</td>
</tr>
</tbody>
</table>

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 48 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 the Department of Management Science, College of Business Administration.

Water Resources Development

William F. Brandes, Director, Water Resources Research Center

3410 Principles of Ground Water Geology (3) (Same as Geology 3410.)
3565 Introduction to Public Administrative Organization and Management (4) (Same as Political Science 3565.)
4110 Managerial Economics (3) (Same as Economics 4110.)
4810 Water Law (3) (Same as Environmental Engineering 4810.)
5000 Thesis (1-15) E
5130 Planning Research Methods I (2) (Same as Planning 5130.)
5160 Planning and Utilities (3) (Same as Environmental Engineering 5160 and Planning 5160.)
5340 Hydrology of Agricultural and Forest Lands (3) (Same as Agricultural Engineering 5340.)
5410-20-30 Interdisciplinary Seminars (3, 3, 3) Problems relating to comprehensive water resource development; flood management, hydroelectric power, navigation, recreation, alternatives in water resource planning, tomorrow in today's planning, project formulation and justification, direct and indirect economic consequences, state and local participation, and municipal and industrial uses of water developments.
The College of Liberal Arts offers programs leading to eight advanced degrees. See page 9 for degrees and majors.

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 DEGREES
Anthropology M.A., Ph.D.
Professors: W. M. Bass (Head), Ph.D. Pennsylvania; C. H. Faulkner, Ph.D. Indiana; A. K. Gutsche, Ph.D. Michigan; P. W. Parmalee, Ph.D. Texas
A. & M.
Associate Professors: I. E. Harrison, Ph.D. Syracuse, R. L. Jantz, Ph.D. Kansas.

The Department of Anthropology offers the Master of Arts and the Doctor of Philosophy degree with concentrations in physical anthropology, cultural anthropology, archaeology, zooarchaeology, and folk culture.

THE MASTER'S PROGRAM
The formal requirements for the Master's degree include:
1. A minimum of three quarters of residence at The University of Tennessee, Knoxville.
2. A minimum of 45 quarter hours for graduate credit, including preparation of thesis. Thirty-six of these 45 hours must be in anthropology, 9 hours may be taken in closely related disciplines (at least one-half of the courses must be at the 5000 level).
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.

3070 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 prerequisite: 2530. F or W
3440 Religion of Primitive Peoples (3) Religions of nonliterate peoples. Place of religion in their social and cultural systems. Recommended prerequisite: 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 prerequisite: 2530. A

5510 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. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A

5520 Problems in Old World Archaeology (3) Selected topics and research problems in European, Asian, and African prehistory investigated in depth. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. (Same as Classics 5620.)

5530 The Maya (3) Intensive survey of Mayan culture from pre-Columbian times to present. Prereq: Consent of instructor. A

5460 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 archaeology as career. May be repeated. Maximum 6 hrs. W

5560 Seminar in Prehistoric Lithic Technology (3) Analysis of techniques employed in production of prehistoric stone industries; raw materials employed; resultant implements, morphology and function; technological constructs utilized in archaeological analysis. Prereq: Consent of instructor.

5570 Seminar on Aboriginal Lithic Resources (3) Trajectories of raw 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 implementation of regional resource surveys, discrete resources in terms of lithological and cultural homogeneity, particularly East and Middle Tennessee. Input from professional geologists, and field research. Prereq: Consent of instructor. A

5700 Theory in Folk Culture Studies (3) Seminar analyzing major theoretical viewpoints of European and American folklore and folk life studies trends from inception. Prereq: Consent of instructor. A

5710 Problems in Folk Culture Studies (3) Topical seminar dealing with selected problems and aspects of traditional behavior in Euro-American culture. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. W

5960 Dermatoglyphics (3) Methods of dermatoglyphic analysis; genetics and population variation of various dermatoglyphic elements; forensic applications; relationships to various genetic and chromosomal abnormalities. Prereq: Consent of instructor.

5970 Emergence and Early Evolution of Man (3) Ancestry and evolutionary significance of Australopithecines. Prereq: 4970 or consent of instructor.

5980 Neanderthal Man and Human Evolution (3) Morphology, distribution, and evolutionary relationships of Neanderthals. Prereq: 4970 or consent of instructor.

5990 Human Variation (3) Nature of human biological variation with emphasis on microevolutionary processes responsible for establishing and maintaining variation and relationship of variation to population structure. Prereq: 3930 or consent of instructor. A

6000 Doctoral Research and Dissertation (3-15) E

6140-23-30 Seminar in Cultural Anthropology (3, 3, 3) Offered each quarter primarily for doctoral candidates.

6610 Selected Topics in Archaeology (3) May be repeated. Maximum 9 hrs.

6910 Selected Topics in Physical Anthropology (3) May be repeated. Maximum 9 hrs.

6970 Seminar in Human Paleontology (3) Prereq: 4970 or consent of instructor.

Archaeology—Greek and Roman

See Classics

Art

MAJOR

DEGREES

M.A., M.F.A.

Professors:

D. F. Kürkoğlu (Head); Ph.D. New York;
R. A. Clarke, M.S. Wisconsin; D. G. Cleaver,
Ph. D. Chicago; J. S. Falsitt; M.S. Ohio State;
P. R. Livingston, M.F.A. Wisconsin; W. F. Loy,
M.F.A. Wichita; B. G. McGeeby, M.F.A. Tulane;
P. G. Nichols, M.F.A. Michigan; W. H. Stevens,
M.F.A. Illinois; C. S. Underhill.

Associate Professors:

S. J. Blain, M.F.A. Wisconsin; R. H. Daehnert, M.F.A. Wisconsin;
W. C. Kennedy, M.F.A. Wisconsin; R. LeFevre,
M.F.A. Rochester Institute of Technology;
W. E. Leland, M.F.A. Tennessee; M. Morganson,
Ph.D. Chicago; F. Moffat, Ph.D. Chicago;
D. Peacock, M.F.A. Michigan; P. D. Piggott,
M.F.A. Claremont; L. D. Wiesener, M.F.A.
Florida State; R. F. Young, M.A. Columbia.

Assistant Professors:

M. C. Claezen, M.F.A. Michigan;
J. F. Darrow, Ed.D. Illinois State;
M. S. Goldenberg, M.F.A. Nebraska;
W. C. Jackson, M.F.A. Tennessee; A. Neif,
Ph.D. Pennsylvania; T. J. Reissing, M.F.A.
Nebraska; M. L. Reisinger, Ph.D. Phil. Yale;
B. R. Wells, M.F.A. Indiana.

Instructor:

F. Bahou, M.F.A. California (Los Angeles).

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 equivalent evidence of proficiency.
Application forms and further information are available by writing to the Department of Art.

**MAJOR OF ARTS**

Areas of concentration consist of ceramics, communication design, drawing, fiber-fabrics, painting, printmaking, sculpture, and watercolor. One year of residence is required.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis</td>
<td>12</td>
</tr>
<tr>
<td>Area of concentration</td>
<td>12</td>
</tr>
<tr>
<td>Drawing and composition</td>
<td>3</td>
</tr>
<tr>
<td>Art history</td>
<td>9</td>
</tr>
<tr>
<td>Electives</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
</tr>
</tbody>
</table>

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, communication design, drawing, fiber-fabrics, painting, printmaking, sculpture, and watercolor. Inter-area concentrations are available with consent of the faculty.

Six quarters beyond the baccalaureate degree are required in residence. Residence is defined by the Department of Art as (1) a minimum enrollment of 6 hours per quarter, and (2) use of Department of Art facilities so that students are available for discussion and criticism. Final examinations are oral, concurrent with project exhibition.

<table>
<thead>
<tr>
<th>Curriculum:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project in Lieu of Thesis</td>
</tr>
<tr>
<td>Major area</td>
</tr>
<tr>
<td>Art history</td>
</tr>
<tr>
<td>Electives</td>
</tr>
<tr>
<td>Seminar in Art Criticism</td>
</tr>
<tr>
<td>Seminar in Art History</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

**DEGREE REQUIREMENTS FOR M.F.A.**

1. Successful completion of 30 hours of study 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 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.

<table>
<thead>
<tr>
<th>3516 Typography (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory and techniques of typesetting and printing as fine art medium. Creative problems using type and printing presses. May be repeated. Maximum 12 hrs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3517 Airbrush (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technique of airbrush. Emphasis on skill and creative applications. For art majors only. F, Sp.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3704 Medieval Art (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byzantine and western art of Middle Ages; manuscript illumination, mosaic, Romanesque pilgrimage church, Gothic cathedral. F.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3705 Northern European Painting: 1350-1600 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From courtly art of late Middle Ages to Northern Renaissance. Jan van Eyck, Roger van der Weyden, Bosch, and Dierickx early printmakers. A.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3715 Early Italian Renaissance Art: 1300-1450 (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development and exploration of naturalism. Revival of antiquity and development of theories of perspective in Early Renaissance. Duccio, Giotto, Masaccio, Donatello, Botticelli. A.</td>
</tr>
</tbody>
</table>

| 3716 The Art of Italy, 1475-1575 (4) Leonardo da Vinci, Michelangelo, Titian, Raphael, Pontormo and Giorgiones. F. |


| 3726 The Art of Northern Europe, 1550-1675 (4) Concentrated study of Bruegel, Rubens, Rembrandt, Georges de La Tour, Vermeer, Poussin and Hals. W. |


| 3736 History of Twentieth-century Painting in Europe and America (4) Fauvism, Die Brücke, Cubism, Der Bläue 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) F. Sullivan and skyscraper. Twentieth century: Viennese leaders, the Bauhaus, Gropius, Van der Rohe. Le 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 1880 to 1900; Neoclassicism to Rodin. From Rodin to present emphasis on Cubism, Constructivism, Expressionism, Assemblage, Pop, Primary Forms, Environments, and Earthworks. Sp. |

<table>
<thead>
<tr>
<th>3753 Crafts in America (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craft movement: growth and development of functional, decorative, educational, and aesthetic values. Role of designer in society as producer and teacher.</td>
</tr>
</tbody>
</table>

| 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 Abstract, Pop, Earthworks, sculpture, and design from 1900. W. |

| 3775 Art of Indian Asia (4) History of Indian art with consideration of art of Central Asia and Southeast Asia. Sp. |

| 3776 Chinese Art (4) F. |

| 3777 Japanese Art (4) F. |

| 3811 Introduction to Museology (3) Concepts, practices and historical development of museums. Art, archaeology, anthropology and science. (Same as Anthropology 3811). |


| 4005 Special Topics (2-4) Student- or instructor-initiated course offered at convenience of department. Prereq. Determined by department. May be repeated. Maximum 16 hrs. |


| 4106 Special Topics in Drawing (4) Student- or instructor-initiated course offered at convenience of department. Prereq. Determined by department. May be repeated. Maximum 16 hrs. |

| 4119 Advanced Design Studio (4) To explore strengths, structural variability and form potentials of design materials, aesthetic potential. Prereq. Senior or graduate standing or consent of instructor. |

| 4206 Special Topics in Painting (4) Student- or instructor-initiated course offered at convenience of department. Prereq. Determined by department. May be repeated. Maximum 16 hrs. |

| 4215 Painting IV (4) Individual concepts of personal expression with varied media on canvas. Prereq. 12 hrs 3215 for art majors; consent of instructor for non-majors. May be repeated. Maximum 12 hrs. E. |

| 4256 Special Topics in Fiber and Fabrics (4) Student- or instructor-initiated course to be offered at convenience of department. Prereq. Determined by department. May be repeated. Maximum 16 hrs. |


| 4315 Watercolor IV (4) Individual concepts in personal expression with varied water-based media in paper. Prereq. 12 hrs 3315 for art majors; consent of instructor for non-art majors. May be repeated. Maximum 12 hrs. E. |

| 4405 Special Topics in Sculpture (4) Student- or instructor-initiated course offered at convenience of department. Prereq. Determined by department. May be repeated. Maximum 16 hrs. |

| 4415 Sculpture IV (4) Individual development of sculptural problems and techniques. May be repeated. Maximum 12 hrs. E. |

| 4470 Wood Design: Advanced Practical Construction (4) Application of laminations, carving and jointing techniques in designing and construction of contemporary furniture. Prereq. 2450 or consent of instructor. May be repeated. Maximum 12 hrs. |

| 4506 Special Topics in Communication Design (4) Student- or instructor-initiated course offered at convenience of department. Prereq. Determined by department. May be repeated. Maximum 16 hrs. |


| 4516 Portfolio and Exhibition Techniques (4) Application of design principles to promotion, construction, display and execution of fine and three-dimensional artists. Prereq: Senior or graduate standing or consent of instructor. Sp. |
4545 Visual Communications Seminar (2) Political, social, economic and ethical problems of contemporary designer. Sessions with outside guest speakers and field trips. Prereq: 4545 W.

4606 Special Topics in Printmaking (4) Student- or instructor-initiated course offered at convenience of department. Prereq: determined by department. May be repeated. Maximum 16 hrs.


4855 Studies in Art History (2) Concentration in selected areas. Prereq: 16 hrs of art history and consent of instructor. May be repeated. Maximum 6 hrs.

4966 Special Topics in Ceramics (4) Student- or instructor-initiated course offered at convenience of department. Prereq: F, W. Determined by department. May be repeated. Maximum 16 hrs.


4970 Glaze Calculation (4) Prereq: Senior or graduate standing and consent of instructor. W.

4971 Klin Construction (4) Prereq: Senior or graduate standing and consent of instructor. Sp.

5000 Thesis (1-15) E

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

5011-21-31 Exhibition in Lieu of Thesis (3, 3, 3)

5101 Foreign Study (1-12) See page 95.

5102 Off-campus Study (1-12) See page 95.

5103 Independent Study (1-12) See page 95.


5325 Graduate Watercolor II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp.


5755 Reading and Research in Art History (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

5770 Seminar in Art History (4) A

5900 Seminar in Art Criticism (4) Theory and practice. Intended for majors in studio art. A


*5975 Graduate Ceramics II (2-6) May be repeated. Maximum 18 hrs. F, W, Sp.

5999 Projects in Lieu of Thesis (10) Prereq: All graduate course work and successful second year evaluation by the graduate faculty. May be repeated. Maximum 30 hrs. E

*A graduate II courses must be preceded by successful first year evaluation by the faculty.

Audiology and Speech Pathology

MAJORS

DEGREES

Audiology

M.A.

Speech and Hearing Science

Ph.D.

Speech Pathology

M.A.

MAJORS

Audiology

Ph.D.

Speech Pathology

M.A.

Professors:

H. L. Lutner (Head), Ph.D. Ohio State; S. Adler, Ph.D. Ohio State; C. W. Asp, Ph.D. Ohio State; P. J. Carney, Ph.D. Indiana; D. M. Lenzer, Ph.D. Washington; I. Nabelek, Sc.D. in Prague; H. A. Peterson, Ph.D. Illinois; B. Silverstein, Ph.D. Purdue.

Associate Professors:

S. B. Burchfield, Ph.D. Michigan State; C. G. Maisel, M.Ed. Texas.

Assistant Professors:

A. Q. Dietsendorf, Ph.D. Washington; E. Ireland, Ph.D. Iowa; C. J. Ferrell, M. A. Tennessee.

THE MASTER'S PROGRAM

A major is offered in Audiology or in Speech Pathology. A minor is offered in each of the two areas when approved by the department. The intent of each major program is to provide the student with the scholarly and professional skills necessary for functioning as an independent professional clinician in any clinical environment. Within this broad coverage of the field of Audiology or Audiology, it is possible for a student to specialize to some extent. For example, in the M.A. in Audiology program, a student may emphasize audiological assessment, aural habilitation, amplification, medical or pediatric, or industrial audiology. Within the M.A. in the Speech Pathology program, a student may emphasize language disorders, cultural language differences, or speech disorders such as aphasia or stuttering. Students interested in specializing beyond the typical broad M.A. program should consult the department office or their advisor for lists of graduate courses, practica and independent studies.

Students majoring in the two areas are expected to complete the academic requirements for clinical certification from the American Speech and Hearing Association, including the required number of clock hours of clinical practicum. An exception to this rule must be approved by the Department Curriculum Committee.

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

Students may elect either the thesis program or the non-thesis option. Students in both programs are required to take 5110 and 5119. The Master's program with the thesis will include a minimum of 45 quarter hours of approved graduate credit, including 9 quarter hours of 5000 level credit in the preparation of an acceptable thesis representing original independent work, and a final oral examination. At least one-half of these total courses must be at the 5000 or 6000 level, no more than 9 hours of which may be thesis courses. Students in the non-thesis option program must present a total of 48 quarter hours of approved graduate credit and pass a final written examination. A minimum of 24 quarter hours must be at the 5000 or 6000 level. The decision as to choice of the thesis or non-thesis program is normally made following completion of 5110 and a conference with the student's advisor.

THE DOCTORAL PROGRAM

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

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

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

College of Liberal Arts 99
4. A comprehensive examination to demonstrate 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. Fulfillment of examination.

4040 Appraisal of Speech and Language Disorders
Diagnostic procedures for children and adults with speech and language problems including observations and physiological measurements. Prereq: 3050. (Same as Special Education 4040). F, Sp

4070 Free Association
Oral and written free association as process for diagnosing and treating communication disorders. Includes didactic self-analysis. W

4100 Speech Development of the Hearing Impaired
(Same as Special Education 4100.)

4200 Practicum in Speech Development of the Hearing Impaired
(Same as Special Education 4200.)

4310 Stuttering
Nature and treatment. Review and integration of various theories. (Same as Special Education 4310.) F, Sp

4320 Clinical Practice in Speech Pathology
Prereq: 3040, 3050, 3310, 4040, and consent of instructor. (Same as Special Education 4320). S/N only. F

4330 Clinical Practice in Speech Pathology
Prereq: 4320 and consent of instructor. (Same as Special Education 4330). S/N only. E

4340 Clinical Practice in Speech Pathology
- Prereq: 3050 and consent of instructor. (Same as Special Education 4340). May be repeated. S/N only. E

4400 Voice Disorders
Etiology, diagnosis, and treatment of organic and functional voice disorders. Prereq: 3065. (Same as Special Education 4400.). W, Su

4450 Clinical Practice in Audiology
Prereq: 4470 and 4900. (Same as Special Education 4450). E

4460 Clinical Practice in Audiology
Prereq: 4450, 4720 and 4930. (Same as Special Education 4460). E

4470 Clinical Practice in Audiology
Prereq: 4460, 4720 and 4930. May be repeated. Maximum 9 hrs. (Same as Special Education 4470). E

4520 Speech Pathology
Independent study of special problems in speech pathology. Prereq: Consent of instructor. E

4550 Problems in Speech Pathology
Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

4610 Introduction to Language Pathology in Children

4620 Birth Defect Syndromes and Language Retardation
Examination of literature relating to both speech and language retardation including clinical, educational and sociocultural implications of such disorders. Prereq: 4610 or consent of instructor. F

4630 Practical Applications of Language Habilitation Techniques
Discussion and demonstration of various methods and procedures used in treating language retarded children. Prereq: 4610 or consent of instructor. W

4640 Parent Participation in Language Habilitation Programs
Nature of counseling and educational relationships with parents of exceptional children including emotional support for families, behavior management strategies, home training methods. Prereq: 4610 or consent of instructor. W

4650 Speech and Language of the Culturally Different Child
Discussion of speech and language differences of children from different minority groups and from different geographic regions; their causes, and their effects upon educational programs. F, W, Su

4680 Topics in Language Retardation and its Habilitation
Selection of topics by representatives of such fields as special education, early childhood education, educational psychology, genetics, and speech pathology. Prereq: 4610 or consent of instructor. Su

4720 Audiology II
Basic principles of clinical audiometry; pure-tone, speech, masking and overview of special auditory instruments. Prereq: 3710. (Same as Special Education 4720). W, Su

4760 Introduction to Hearing Conservation

4930 Aural Rehabilitation: Speechreading and Auditory Training
Rehabilitation of acoustically impaired by maximizing use of residual hearing and utilizing speech as receptive communication process. Prereq: 4720. (Same as Special Education 4930). F, W, Su

5000 Thesis
1-15 E

5002 Non-Thesis Graduation Completion
3-15 Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirement and/or repeated. Maximum 16 hrs. E

5040 Advanced Clinical Practice in Audiology Study and Practice
Prereq: 4720 and 4950. May be repeated. Maximum 12 hrs. (Same as Special Education 5040). E

5054 Practicum in Hearing Aid Orientation and Communication Counseling
Practical exposure to counseling hard of hearing and family members concerning, use and expectations of hearing aids, suggestions for better use of communication skills. Prereq: 4720, 4930, and consent of instructor. May be repeated. Maximum 6 hrs. E

5050 Practicum in Verbo-Tonal Habilitation
Prereq: 4940, 5950, or consent of instructor. May be repeated. Maximum 9 hrs. E

5051 Practicum in Aural Rehabilitation
Prereq: 4720 and 4950. May be repeated. Maximum 9 hrs. E

5060 Anatomy and Physiology of Speech
Structure and function of neuromuscular systems involved in breathing, phonation, resonance, and articulation. Prereq: 4650. F, W

5070 Anatomy and Physiology of Hearing
Structure of human ear, pathology of hearing impairment, and psychoacoustics of audition. Prereq: 3710. F

5071 Physiological Acoustics and Electrophysiology
Techniques for electrophysiological measurement of auditory sensitivity, sound transmission by ear, distortion in ear, and ear as analytic mechanism. Prereq: 4720, 5070 or consent of instructor. Sp, Su

5081 Adult Dysarthria
Neuromotor organization and speech and language training. Prereq: 5060. F

5082 Adult Cleft Palate
Surgical and therapeutic considerations in managing patients with cleft palate. Prereq: 3710 or consent of instructor. Sp

5085 Practicum in Hearing Conservation
Prereq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. E

5090 Practicum in Hearing Conservation
Supervised on-site experience consisting of observation at hearing conservation programs at industrial settings. Prereq: 5040. May be repeated. Maximum 6 hrs. E

5095 Seminar in Audiology
Significant research in various areas of audiology. Prereq: Consent of instructor. May be repeated. Maximum 16 hrs. F, Sp

5096 Special Auditory Tests
Theoretical and practical considerations of auditory procedures used for differentiating between cochlear vs. retrocochlear auditory lesions, identifying central auditory lesions and nonorganic hearing loss. Prereq: 5040.

5097 Special Problems in Audiology
Prereq: 4720 or equivalent and consent of instructor. May be repeated. Maximum 6 hrs. E

5120 Seminar in Speech Pathology
Current topics 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.

5140 Seminar in Language Pathology
Nature, etiology and treatment of retardation language development in children. Prereq: 4610 (Same as Special Education 5140). F

5150 Special Problems in Speech Pathology
Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. E

5156 Independent Study in Speech Pathology
Prereq: 1-3
Biochemistry

MAJOR

DEGREES

Biochemistry

M.S., Ph.D.

Professors:
\text{K. J. Monty (Acting Head), Ph.D. Rochester; J. E. Churchill, Ph.D. Sheffield (England); T. P. Salar (Associate Head), Ph.D. Michigan.}

Assistant Professors:
\text{L. B. Brattsten, Ph.D. Illinois; R. Bryant, Ph.D. Illinois; W. Feinberg, Ph.D. California (Berkeley); L. Huang, Ph.D. Michigan State.}

The graduate program consists of an orientation examination to determine the most suitable course work for the incoming graduate student, 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 preliminary examinations, and extensive research leading to the Ph.D. dissertation and its oral defense.

The orientation examination: Given fall quarter at 9:00 a.m. on the Thursday prior to the week in which classes begin, is taken by all incoming students without exception. The purpose of the examination is to aid in placing students in the proper courses to help ensure their success in the graduate programs. The examination will cover analytical, organic and physical chemistry. If the student's undergraduate program does not show appropriate courses in one of the subjects, the student will not take that part of the examination but will be enrolled in a suitable course. The results of the examination will help determine appropriate course work.

The qualifying examination: At the conclusion of the first year's work in 5510-20-30, 5310-20-30 and 4230, a comprehensive qualifying examination covering all of the material will be taken by all first year graduate students, without exception, in the first week of the summer quarter. On the basis of results of the examination, the student will be counseled concerning his/her future in the biochemistry program.

THE MASTER'S PROGRAM

This program requires about two years of full-time study and provides both breadth and depth of training by mixing classroom instruction and 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 disciplines. All graduate courses 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 quarter of analytical chemistry, and a minimum of three quarters of approved physical chemistry.

2. A minimum of 12 hours of approved biology courses beyond the introductory level, including at least 3 hours of genetics and 3 hours of physiology.

3. An orientation examination as described above.

4. At least 9 hours of advanced lecture-seminar courses from the following:

- Biochemistry 6410, 6010.

- At least 9 hours of Master's research and a thesis.

- 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 preliminary examinations; 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 one year), at least three quarters of approved graduate courses in chemistry or physics, for example: Chemistry 5110-20-30-35, Chemistry 5340, Physics 5210-20-30, Physics 5440, Physics 5510-20-30; plus minimum of three quarters

*Though completion of these courses or the equivalent is required, they may not be taken for graduate credit.
of approved physical chemistry (Biochemistry 410-20-30, or Chemistry 4910-20-30) 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 102 credit hours of graduate credit in an approved area of specialization which should be identified early so that necessary prerequisites can be taken.

2. Orientation examination.


4. In addition to the courses listed in item 3 above, four courses selected from those numbered 5110 or higher, excluding 5300 or 5640.

5. Qualifying examination.

6. Participation in Biochemistry 6410 and in the advanced biochemistry seminars 6010 during the entire period of residence.

7. Preliminary examination: Students who pass the comprehensive qualifying examination with sufficiently high marks and those who complete a mandatory M.S. degree (required prior to the preliminary examination) will be admitted to the dissertation at a time and of a format compatible with Graduate School requirements as determined by the student’s committee.

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

9. A final examination which will be concerned primarily with the student’s dissertation.

Applying 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 half of which must be at or above the 5000 level; and

b. The preparation of a research manuscript suitable for submission for publication in a major scientific journal; and

c. The oral defense of that manuscript by the student in the presence 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) Electrophore type behavior; chemistry and structure of proteins; enzyme behavior and biological function; catabolism and energy capture; synthetic metabolism; nucleic acid function; protein synthesis and biosynthesis; regulation of biological processes. Must be taken in sequence. Prereq: Chemistry 2110-1-21, 2120-1, 3100-1, 3200-1, and 1 course from Biology 1210-20-30 or Botany 1110-20-30, 3 lectures and discussion. F, W, Sp.

4119 Cellular and Comparative Biochemistry Laboratory (2) Basic biochemical procedures of general and specialized research and molecular biology. Prereq or coreq: 4110. F, W

4210 Introduction to Physical Biochemistry (3, 3) 4210—Introduction to thermodynamics, phase stability and chemical potential; osmotic pressure; activity and the Debye-Huckel model; electrochemistry; membrane permeability. 4220—Elements of statistical mechanics, diffusion, collission theory; chemical kinetics and transition state theory of activation; catalysis; specialized kinetics of enzymatic processes; some biopolymer considerations. Prereq: Mathematics 1840-50-60; Chemistry 2110-21-31 and 3210-29-39, and an introductory course in biology. F, W

4230 Introduction to Physical Biochemistry (3) Physical characterization of macromolecules, polarized light, absorption and fluorescence, sedimentation and transport hydromechanics, electrophoretic mobility, and structural x-ray crystallography of proteins and nucleic acids. Prereq: 4220 or Chemistry 3430, or equivalent. Sp

5000 Thesis (1-15) E

5010 Biochemical Techniques (2) Theory and laboratory practice in chromatographic and electrophoretic techniques in isolation and characterization of macromolecules of importance in biochemistry and molecular biology. Prereq: 4110 or equivalent. Open to undergraduates with consent of department.


5120 Biochemistry of Mitochondria and Selected Organelles (3) Organization of compartmentalized metabolic systems in mitochondria and other cell organelles. Supramolecular organization, bioenergetics, transport systems, drug metabolism, oxygen toxicity and defense mechanisms, nitrogen fixation and photosynthesis. Emphasis on experimental approaches. Prereq: 4210 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 specificity in catalysis; allosteric, transient, relaxation, and allosteric kinetics of catalysis. Prereq: 4110 and either 4220 or Chemistry 3430.

5210 Structure and Function of Biological Membranes (1) Structural organization of biological membrane components. Dynamic properties as studied biochemically and biophysically. Selective topics of membrane functions related to structural organization.

5220 Structures and Functions of the Nucleic Acids (3) Chemistry of nucleic acids; hydrogen bonding and double-stranded structures; coiling, supercoiling, and other higher order structural considerations; biosynthesis of DNAs and RNAs; repair mechanisms; degrading mechanisms; mechanisms of genetic information storage and retrieval. Prereq: 4110-20 or equivalent.

5230 Protein Synthesis and Its Role in Metabolic Regulation (3) Mechanism of assembly of peptide chains; ribosome structure and function; deciphering and genetic code; regulation of transcription and translation of proteins (induction, repression, etc.). Prereq: 4110-20.

5300 Graduate Research Participation (3-9) May be repeated. Maximum 12 hrs.

5310-20-30 Experimental Techniques (2, 2, 3) Tutorial laboratory course in modern experimental methodology and instrumentation. Intended primarily for departmental majors. F, W; Sp

5450 Special Topics (1-3) Registration only by prior arrangement with department. May be repeated.

5510 Properties of Biomolecules Related to Function (3) Structures, chemical and physical properties of biopolymers developed from theoretical and experimental points of view to explain actions and interactions. Prereq: Chemistry 3211-21-31, Chemistry 2140 recommended. Prereq or coreq: 4120, Chemistry 4910 or equivalent. F

5520 Molecular and Cellular Basis of Metabolic Regulation (3) Regulation of metabolic pathways dependent on energy demands of organisms and on end products of specific nutritional states. Prereq or coreq: 5510 or consent of department. Coreq: 4220 or Chemistry 4920 or equivalent. W

5530 Biosynthesis and Regulatory Functions of Intermediates (3) Chemistry of RNA, and Proteins: Roles in replication, transcription, translation and metabolic regulation. Prereq: 5520, Coreq: 4230. S

5610 Environmental Toxicology (3) Basic concepts in toxicity, interactions at subcellular, cellular, organ, organismal, population, and environmental levels, legal aspects. Major emphasis on biochemical toxicology. Prereq: 4110-20, Chemistry 3211-21-31, Chemistry 4910-20-30, or consent of instructor. (Same as Ecology 5610) W

5640 Techniques in Environmental Toxicology (2) Survey of experimental techniques for assessment of presence, toxicity, and impacts of pollutants in the environment. Laboratory exercises focus on analytical, biochemical, and bios assay methods employed in toxicological studies. Prereq: Chemistry 4110-21-21, or Biol. Chemistry 4910-21-21, or equivalent of yr of physics; or consent of instructor. (Same as Ecology 5640) Sp

6000 Doctoral Research and Dissertation (3-15) E

6010 Advanced Biochemistry Seminar (1) Topics to be covered posted in spring quarter for following year. Invited speakers of note will participate. May be repeated. Maximum 9 hrs. S/N only. Coreq: F, W, Sp

6410 Current Topics in Biochemistry (1) Seminars and lectures dealing with current advances in field of biochemical. May be repeated with consent of department. S/N only. Coreq: F, W, Sp

6420 Current Topics in Biological Membrane Research (1) Current literature on biological membrane research. Prereq: 4110-20 or equivalent. May be repeated. Maximum 9 hrs. S/N only. (Same as Microbiology 6420). F, W, Sp

6431 Current Topics in Environmental Toxicology (1) Critical review of current research problems and methods in environmental toxicology; behavioral toxicology, biochemical and ecological effects, biostatistics and epidemiology. Presentations by students, faculty and guest lecturers from academia and industry. May be repeated with consent of department. Maximum 6 hrs. (Same as Ecology 6431) S/N only. Coreq: F, W, Sp

6450 Advanced Special Topics (1-3) Registration only by prior arrangement with department. For students who have passed Ph.D. preliminary examination or are in advanced state of graduate studies. Topic title posted in advance. May be repeated. Maximum 9 hrs.

Biology

MAJOR

DEGREE MACT

The Master of Arts in College Teaching program is administered by an interdepartmental committee composed of one representative from each of the following departments: Botany, Biology, Microbiology and Zoology. Inquiries regarding the program should be addressed to the chairperson of the committee. The admission requirements are:

1. Bachelor’s degree with satisfactory record.

2. Two or more quarters of college mathematics.

3. Twelve or more quarters of physical sciences.

4. Two or more quarters of general biology, general botany, or general zoology.

5. Five or more quarters of advanced biology courses.

Requirements for the degree: All candidates for the MACT degree in Biology will meet a minimum distribution of graduate and undergraduate courses as follows:

1. Eight quarter hours in each of the following:

   a. Taxonomy and/or Ecology.

   b. Morphology, Developmental Biology and Zoology.

   c. Physiology and/or Biochemistry.

   d. Genetics, Cytology and/or Cyto genetics.

2. Eighteen quarter hours of graduate credit in each of the following four fields: biochemistry, botany, microbiology,
zoology or 36 quarter hours of graduate credit among the four fields as specified by the interdepartmental committee administering the MACT program in Biology.

3. At least 21 quarter hours of course work in requirement 2 (not including special projects and thesis) numbered at the 5000 or 6000 level.

4. At least 9 quarter hours of Master's research and an acceptable thesis.

5. Total graduate credit in the biological sciences (or appropriate supporting fields) of 57 quarter hours (including that in items 1, 2, 3, and 4).

6. A three-quarter, 1-hour seminar (or seminar series) on the problems and techniques of college teaching.

7. Six quarters of part-time, supervised college teacher-internship training.

8. A final comprehensive oral examination covering the thesis endeavor and the subject matter of the course requirements.

**Botany**

**MAJOR**

Botany, B.A. degrees

M.S., Ph.D.

**Professors:**

R. W. Holton (Head), Ph.D. Michigan; E. E. Clebsch, Ph.D. Duke; H. R. DeSelm, Ph.D. Ohio State; J. W. Haida, Ph.D. Chicago; L. M. Mead, Ph.D. Indiana; W. D. Vanderbilt; L. W. Jones, Ph.D. Texas; L. G. Hickok, Ph.D.

**Associate Professors:**

E. E. Schilling, Ph.D. Ohio; P. H. Wood, Ph.D. Texas; O. J. Schwarz, Ph.D. Duke; L. W. Jones, Ph.D.

**Assistants:**


The Department of Botany offers the Master of Science and Doctor of Philosophy degrees with concentrations in anatomy, botany, cytology, cytogenetics, ecology, genetics, ichnology, morphology, mycology, photobiology, physiology, phycology, pteridology, and systematics.

Requirements for admission: In addition to the general Graduate School requirements (see page 11) the botany department also strongly recommends submitting an aptitude test 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 college chemistry, 12 quarter hours.
3. General inorganic chemistry, 12 quarter hours.
4. College mathematics, 9 quarter hours.

General degree requirements are given on pages 8-9. Special departmental requirements include successful completion of the following.

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**THE MASTER'S PROGRAM**

**A. Thesis Program**

1. Satisfactory preparation of a written formulation and oral defense to the student's committee of research proposal suitable for a thesis problem. Must be completed before enrollment in Botany 5000.

2. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030.

3. Satisfactory completion of 2 credit hours at the 6000 level.


5. Presentation of a thirty-minute departmental seminar.

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

7. Non-Thesis Program

1. Satisfactory completion of 51 quarter hours of approved graduate courses of which 30 quarter hours must be in botany including Botany 5003 and 5004.

2. Satisfactory completion of 2 credit hours at the 6000 level.

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

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**THE DOCTORAL PROGRAM**

1. Satisfactory presentation of a written formulation and oral defense to the student's committee of a research proposal suitable for a dissertation problem. Must be completed before enrollment in Botany 6000.

2. Satisfactory performance on a final comprehensive preliminary examination.

3. Presentation of one or more cognate areas outside of the department totaling 9 graduate credit hours with at least a B average.

4. Satisfactory performance on an examination in one modern foreign language or an A or B in French 3030 or German 3030.

5. Satisfactory completion of 9 credit hours at the 6000 level (excluding dissertation).


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

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

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**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's faculty committee.**

**3010-20 Plants in Evolution (4, 4) Monera to angiospermae; emphasis on evolutionary relation- **ships, morphology and development. Prereq: 6 hrs in biological sciences. F, W

**3030 Field Botany (4) Study of plants in natural environments including plant identification, collection, preservation and basic ecological concepts. Prereq: 6 hrs in biological sciences. 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 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)

**3090 Biology and Human Affairs (3) Basic biological principles involved in deterioration and preservation of an environment in which human cultures may survive. F

**3130 Introductory Plant Pathology (4) (Same as Agricultural Biology 3130)

**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: 1 yr general chemistry and 1 yr biological science. F, Sp

**4017 Field Mycology (3) Field experience on identification of fungi and use of taxonomic keys. Prereq: 6 hrs field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Sp, Su

**4021 Field Bryology (3) Field experience on identification of mosses and liverworts. Frequent field trips, field recognition of species and habitats, laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

**4022 Field Lichenology (3) Field experience on identification of lichens. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 8 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

**4023 Field Agrostology (3) Field experience on identification of grasses. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 8 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

**4030 Mechanisms of Plant Speciation (4) 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: Botany 3010-20 or equivalent. Sp, Su

**4050 Synanthropology (3) Field experience on identification of compostae. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

**4055 Identification of Woody Plants (3) Field identification of native trees, shrubs and woody vines of Southwestern United States. Recognition of key characteristics, significant aspects of natural history of local species. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A

**4061 Field Physiology (3) Field experience on identification of fresh algae. Frequent field trips, field recognition of species and habitats; laboratory sessions. Prereq: 6 hrs botany. Recommended prereq: Botany 3010-20 or equivalent. Su, A
cycles as applied to evolution in group. Cultures and specimens in laboratory. Prereq: 3010 or equivalent. F, A

5120 Agrostology (4) Collection, identification, classification, and physiology of tribes of grass. Prereq: 3030 or consent of instructor. 2 hrs and 2 labs. F, A

5150 Advanced Morphology of Flowering Plants (4) Vegetative and reproductive organography: regularity, physiological, floral development, pollination mechanisms, embryology and deviations, seed and fruit development. Prereq: 3030-30 or 4120; 5210 or consent of instructor. Sp, A

5160 Biosystematics (4) Major experimental methods used in systematics and application to specific types of plants and fungi. Prereq: Botany 3010-20 or equivalent. F, A

5210 Advanced Plant Physiology I (3) Plant cell physiology, response of plants to light: photosynthesis, photomorphogenesis mediated reactions. Water and solute uptake, loss, and movement; translocation; and fundamentals of mineral nutrition. Prereq: 5210 or Biochemistry 4120 and plant or botany course. Recommended prerequisite: 1 yr of physics. W

5235 Advanced Plant Physiology III (3) Cellular and organismic aspects of ecosystem development; macromolecular interpretation of differentiation dormancy: germination; flowering; and senescence. Prereq: Botany 4120 and a plant cell physiology course. Recommended prerequisite: 5220.

5290 Quaternary Problems (4) (Same as Geology 5520 and Zoology 5020)

5310-20-30 Special Problems in Botany (1-6, 1-6, 1-6) Special problems and materials in botany. May be repeated. Maximum 12 credits. F; W; Sp. 5360 Marine Ecology (3) Relationships of marine organisms to environment and their interactions with each other and with coastal and estuarine ecosystems: succession; deep-sea ecology; stability. Prereq: One previous ecology course.

5410-20-30 Seminar in the Teaching of College Botany (1, 1, 1) Objectives in teaching of general botany. Supervised teaching in general course: seminars in techniques, testing, concepts, and materials. Required of teaching assistants. Prereq: Consent of instructor. S/NC only. F; W; Sp

5440 Seminar in Botany (1) Readings and discussions of current literature and/or selected topics in botanical research. May be repeated. Maximum 12 hrs. S/NC only.


5780 Plant Cyology (4) intensive consideration of cellular organization of the plant 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; cell fractionation and isolation of subcellular components; differentiation and analytical centrifugation; photomicrography and microcinematography. Required 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 chromosome behavior in hybridization, speciation, and polyploidy. Laboratory emphasis on normal and aberrant meiotic systems and chromosomes from plants and animals. Prereq: Biology 3110 and at least 6 additional hrs in biological sciences. Sp

5830-21-22-23-24 Methods and Instrumentation in Laboratory Investigation (1, 1, 1, 1, 1, Laboratory course providing project experience and theoretical background in various research methods. lon-exchange, resins, adsorption spectoeometry, disc electrophoresis, polarography, zonal and ultracentrifugation, gas chromatography, automatic analyzers, and computers. Methods, use and detection of radioisotopes, and others. Prereq: Course in plant physiology, Chemistry 3211-23-31 or equivalent, Physics 2210-20-30 or equivalent. S/NC only.

5830 Field Methods in Plant Communities and Ecosystems (1, 1) Emphasis on practical and theoretical aspects of field methods and instrumentation. Topics vary according to needs of students. May be repeated with consent of instructor. S/NC only. F

5870 Experimental Plant Genetics (4) Genetics of plants stressing molecular aspects and including mechanisms of gene action, controlling elements, transformation, cytoplasmic inheritance, and adaptation. Prereq: Biology 3110 and Chemistry 3231: 3 hrs and 1 lab. W

5910-20 Developmental Plant Morphology (3) Developmental morphological aspects of selected groups of plants, including phenomena of morphogenesis-correlations, polarity, symmetry, differentiation, regeneration, tissue growth, and general genetic and environmental factors. Prereq: 3010-20 or 4120, and 3210 or 5210 for 5910; 5910 for 5920, 2 hrs and 1 lab for 5910; 1 lab for 5920. F, A

6000 Doctoral Research and Dissertation (3-15) E

6010 Advanced Topics in Morphology of Vascular Plants (2-4) Needs of students determine content. Topics selected from broad categories of experimental, morphological, ecological, and developmental morphology of cryptogams. May be repeated. F, A. 6050 Advanced Topics in Cryptogamic Botany (2-4) Advanced studies and current research in experimental morphology, mycology, Bryology, pteridology, and development morphology of cryptogams. May be repeated with consent of instructor. Sp

6060 Advanced Topics in Cryptogamic Botany (2-4) Advanced studies and current research in experimental morphology, mycology, Bryology, pteridology, and development morphology of cryptogams. May be repeated with consent of instructor. Sp

6210 Photobiology (3) Interaction of nonionizing radiation with living systems. Prereq: Physics 2210-20-30 or equivalent. Biochemistry 4110. F

6310 Advanced Topics in Cytology and Cell Biology (3-5) Requirements and interests of students determine topics, such as actions of chemicals on actively dividing cells, current ultrastructural research in selected cytoplasmic organelles and cellular systems, experimental cytology, cellular control of nucleic acids, and biochemical localization of organelles. Prereq: 4310; Biochemistry 4110-20. May be repeated with consent of department.

6320 Ecosystems of the World (3) Classification and characterization of world’s regional ecosystems. Interrelations of climate, topography, soils, vegetation, and fauna. Prereq: S

6420 Advanced Topics in Genetics (2-4) Literature surveys of selected topics in field of genetics. Prereq: Biology 3110; Biochemistry 4110-20. May be repeated with consent of department. F, A

6560 Seminar in the History of Botany (4) Historical development of the science of botany. Prereq: F
Chemistry

MAJOR

DEGREES

Chemistry

M.S., MACC, Ph.D.

Professors:

G. Mamantov (Head), Ph.D. Pennsylvania State;
N. S. Bowman, Ph.D. Princeton; C. A. Buchel1 (Emeritus), Ph.D. Buffalo;
Ph.D. Illinois; J. C. Chambers, Ph.D. Kansas;
C. J. Collins, Ph.D. Northwestern; J. A. Deen, Ph.D. Michigan; W. Keenan, Ph.D. Texas;
D. C. Kleinfelder, Ph.D. Princeton; J. W. Larsen, Ph.D. Purdue;
M. H. Lietzke, Ph.D. Wisconsin;
D. O'Keefe, Ph.D. Berkeley;
J. R. Peterson, Ph.D. California (Berkely);
G. K. Schwarzer1, Ph.D. Illinois; D. A. Shirley (Emeritus), Ph.D. Iowa State; H. A. Smith (Emeritus), Ph.D. Harvard; W. T. Smith (Emeritus), Ph.D. Ohio State; W. A. Van Hook, Ph.D. Johns Hopkins; L. L. Weyg, Ph.D. Purdue; T. F. Williams1, Ph.D. Purdue; J. W. Wood (Emeritus), Ph.D. North Carolina.

Associate Professors:

J. E. Bloo, Ph.D. Manchester; G. W. Kabaka, Ph.D. Purdue; J. F. Kintzle, Ph.D. Akron;
C. A. Lane, Ph.D. California (Berkely);
R. M. Magid, Ph.D. Yale; R. M. Pagni, Ph.D. Wisconsin.

Assistant Professors:

J. L. Adcock, Ph.D. Texas; A. S. Glaim, Ph.D. Tennessee;
J. D. Kovac, Ph.D. Yale; L. J. Magid, Ph.D. Tennessee;
F. M. Schell, Ph.D. Indiana;

Students majoring in Chemistry for the M.S. degree are required to present as a prerequisite one year each of general, analytical, organic and physical chemistry with a satisfactory record. Students lacking any of these prerequisites may be admitted with appropriate deficiencies which must be removed without graduate credit. For students minoring in Chemistry, the prerequisite is two years of chemistry including quantitative analysis.

THE MASTER'S PROGRAM

The department offers specialization in seven areas for the M.S. degree: analytical chemistry, environmental chemistry, energy, inorganic chemistry, organic chemistry, polymer science, and physical chemistry. The requirements for the M.S. degree in Chemistry consist of the satisfactory completion of:

1. Research and a thesis to give 9 to 18 hours of graduate credit (5000).
2. Chemistry 4160-70 and two of the following:
   5511, 5521, 5531.
3. Sufficient additional graduate course work in chemistry and/or related field to give at least 36 hours of graduate credit.

A comprehensive advanced examination in the field of specialization is required after the above requirements are completed.

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, physical chemistry, polymer science, and theoretical chemistry. For the Ph.D. degree in Chemistry with specialization in analytical, inorganic, organic, physical, or related areas, the satisfactory completion of the following is required:

1. Research and a dissertation to give at least 36 hours of graduate credit (5000).
2. Chemistry 4160-70 and two of the following:
   5511, 5521, 5531.
3. Participation in seminar (5911-21-31) during the entire period of graduate study.
4. Thirty-nine hours of additional graduate course work including at least 6 hours at the 6000 level and one of the following groups: (a) for analytical 5250-50-60-67-79; (b) for inorganic, 5420, 5710-20-30; (c) for organic, 5110-20-29-30 for 5410-70; (d) for theoretical, 5340-50, 5410-20-30-50; (e) for theoretical, 5340-50, 5410-20-30-50, Physics 5210.

Graduate course work in areas of special interest may be used for undesignated course work in this requirement upon approval of the student's faculty committee.

5. A comprehensive advanced examination in the field of specialization.
6. Demonstration of a reading knowledge of one of the following languages: French, German, Russian, or an approved alternate.

7. A final oral examination.

The requirements for the Ph.D. degree in Chemistry with specialization in environment or energy consist of the satisfactory completion of:

1. Research and a dissertation on an environment- or energy-related problem to give at least 36 hours of graduate credit.
2. Chemistry 4160-70 and two of the following:
   5511, 5521, 5531.
3. Sufficient additional graduate course work in chemistry and/or related fields to give a total of 72 hours. For emphasis in environment, these additional courses must include Chemistry 5220, 5250-50-60-67-79, Ecology 5310, and Environmental Engineering 4030. For emphasis in energy, these additional courses must include Chemistry 5410, 5610-20-30, a chemistry sequence (Chemistry 5110-20-30-35 or 5250-60-70 or 5420-30 or 5710-20-30, 5810), and Mechanical Engineering 4160. All course selections must be approved by the appropriate departmental committee.
4. Participation in seminar (5911-21-31) during the entire period of graduate study.
5. A final oral examination.

MASTER OF ARTS IN

COLLEGE TEACHING

The requirements for the M.A.T. degree in Chemistry consist of the satisfactory completion of:

1. Chemistry 4160-70 and two of the following:
   5511, 5521, 5531.
2. Research and a thesis to give 9 hours of graduate credit (5000).
3. Sufficient additional graduate course work in chemistry and/or related field to make an overall total of 60 hours. The additional hours must include two of the following sequences: 5110-20-29-30, 5250-50-60-67-79, 5340-50, 5410-20-30, 5710-20-30.
4. Participation in seminar (5911-21-31) during the entire period of graduate study. No more than 3 credit hours of seminar may be applied to the above requirements.
5. A final oral examination.
DEMONSTRATION OF A READING KNOWLEDGE OF
ONE OF THE FOLLOWING LANGUAGES: FRENCH,
GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
A FINAL ORAL EXAMINATION.
FOR THE PH. D. DEGREE IN CHEMISTRY WITH SPECIALIZATION IN CHEMICAL PHYSICS, THE
SATISFACTORY COMPLETION OF THE FOLLOWING IS REQUIRED:
1. RESEARCH AND A DIsSERTATION TO GIVE AT LEAST 38 HOURS OF GRADUATE CREDIT (6000).
3. THE REQUIREMENTS LISTED IN ITEMS 3, 5, 6, AND 7 ABOVE.
THE PROGRAM IN CHEMICAL PHYSICS IS CONDUCTED JOINTLY WITH THE PHYSICS DEPARTMENT WHICH OFFERS A SIMILAR DEGREE.
A. A FINAL ORAL EXAMINATION.
B. A DEGREE WITH SPECIALIZATION IN POLYMER SCIENCE IS CONDUCTED JOINTLY WITH THE DEPARTMENT OF CHEMICAL, METALLURGICAL, AND POLYMER ENGINEERING, WHICH OFFERS A DEGREE WITH A SIMILAR SPECIALIZATION. THIS SPECIALIZATION REQUIRES SATISFACTORY COMPLETION OF:
1. RESEARCH AND A DIsSERTATION TO GIVE AT LEAST 38 HOURS OF GRADUATE CREDIT (6000).
2. COURSES 4119, 5511, 5521, 5540, 5610, 5710, 5911-21-31 AND THE POLYMER SEMINAR PROGRAM DURING THE ENTIRE PERIOD OF GRADUATE STUDY.
3. THIRTY HOURS OF ADDITIONAL GRADUATE COURSE WORK, INCLUDING AT LEAST 6 HOURS AT THE 6000 LEVEL AND AT LEAST 12 HOURS FROM THE DEPARTMENT OF CHEMISTRY OFFERINGS.
4. THE DEMONSTRATION OF ADVANCED EXAMINATION IN POLYMER SCIENCE.
5. THE DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
6. THE DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
7. A DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
8. A DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
9. A DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
10. A DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
11. A DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
12. A DEXTERITY OF A READING KNOWLEDGE OF ONE OF THE FOLLOWING LANGUAGES: FRENCH, GERMAN, RUSSIAN, OR AN APPROVED ALTERNATE.
6531 Survey of Organic Chemistry (3) Bonding in organic chemistry of hydrocarbons, benzenoid and polyaromatic hydrocarbons, polynuclear aromatic hydrocarbons, tricyclic compounds, tetraacene and other polyacenes, biological significance. Prereq: two of 5110-20-30-35. Maximum 9 hrs. A.

6570 Organic Physical Chemistry (3) Structure, chemical structure of ground and excited-state molecules, stereochemistry, and nuclear magnetic resonance. Prereq: two of 5110-20-30-35. Maximum 9 hrs. A.


6720 Advanced Analytical Spectroscopy (3) Newer methods of spectroscopic analysis, including: transform methods, lasers in spectroscopy, fiber optics, and spectroscopic techniques for remote sensing. Prereq: 5250.

6721 Selected Topics in Analytical Chemistry (3) Subject matter varies among important topics of chemical speciation, inorganic and organic, electrophoresis, spectroscopy, colorimetry, new electroanalytical methods, bioanalytical methods, and microcomputer and microprocessor applications in chemical instrumentation. Prereq: Consent of instructor. May be repeated. Maximum 9 hrs. A.

6731 Advanced Topics in Molecular Spectroscopy (3) Application of newer methods to complex systems including metal complexes, polymers, and molecules of biological significance. Time dependent phenomena. (Effect of external fields and collision processes.) Recent theories of chemical reactivity. Prereq: 5410. Maximum 9 hrs. A.

6750 Molecular Spectroscopy (3) Structure, spectroscopic properties, solution thermodynamics, electrochemistry and phase equilibria of molten salts. Solutions of metals in molten salts. Prereq: 4110 and 5410 or equivalent.

6810 Vibrational Problems in Molecular Spectra (3) Sames 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 Vibrational-Rotation Theory (3) Same as Physics 6820.

Classics

Professors: H. C. Rulleide (Head), Ph.D. Ohio State; A. Rapp (Emeritus), Ph.D. Illinois


Assistant Professors: B. J. Levy, Ph.D. Texas; P. J. Nissen, Ph.D. Ohio State.

The graduate courses in the Classics include the wide 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 literature.

Greek

3010 Plato (3) A

3020 Herodotus (3) A

3030 Euripides (2) A

3040 Aeschylus, Sophocles (3) A

3050 Lysias (3) A

3060 Aristophanes (3) A

4050-60-70 Directed Readings in Greek (3, 3, 3) F; W; Sp

Latin

3440 Livy (3) A

3450 Pliny and Martial (3) A

3460 Elegiac Poets (3) A

4120 Horace, Satires and Epistles (3) A

4130 Selected Readings from Latin Literature (3) A

4130-30-30 Selected Readings from Latin Literature (3, 3, 3) May be repeated. A; A

4340 Horace, Odes (3) A

4350 Tacitus (3) A

4360 Lucilius (3) A

4370 Readings in Medieval Latin (3) A

5410-50-50 The Latin Epic: Lucan, Vergil, Lucan (3, 3, 3, 3) A; A; A

5510-20-30 Roman Comedy: Plautus, Terence (3, 3, 3) 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, and discussion. (Same as Religious Studies 3220.) W
108 College of Liberal Arts

3220 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 3220.) W

3310 Art and Archaeology of the Aegean Bronze Age and Early Greece (3) Troy, the Cyclades Islands, Greek mainland, and Crete. Emphasis on palaces, major cities, temples, burial sites, their fall, the following Dark Age, and rebirth of Greek civilization. Illustrated lectures. F

3320 Art and Archaeology of Hellenistic Greece and Rome (3) Survey of development of Greek architecture, sculpture, and painting from 300 B.C. to death of Alexander. Illustrated lectures. W

3330 Art and Archaeology of Classical Greece and Rome (3) Hellenistic Greek, Etruscan, and Roman sculpture, painting, and architecture with attention to city planning. Illustrated lectures. Sp

3340 Cities of the Greek and Roman World (3) Archaeological survey of Greek and Roman cities from 3000 B.C. to 500 A.D. with emphasis on development of city planning and quality of life. Such cities as Mycenea, Athens, Priene, Alexandria, Rome, and Lepcis Magna will be studied. F

3350 Shrines and Sanctuaries of the Greek and Roman World (3) Survey of major shrines and sanctuaries of Greece and Rome with emphasis on archaeological remains. Such sites as Olympia, Epidauros, Paestum, Cuma, Praeneste, and Baalbek will be considered. Readings in selected classical authors will add to understanding of place of great shrines and sanctuaries in Greek and Roman life. W

4010 Greek Drama in English Translation (3) Survey of dramatic masterpieces of Greek literature. A

4210 Teaching of Latin (3) Carries no language credit. Purposes, techniques, materials, and evaluation; directed observation in public schools; preparation of teaching plans and materials. A

4220 Seminar in Classical Studies (3) Special problems in literatures and other arts of Greece and Rome. May be repeated with consent of department. W

4230 Classical Mythology and Its Uses (3) Intensive review and survey of Greek and Roman mythology. Emphasis on uses of classical mythology in literature, music, and plastic arts, especially of modern times. A

4510 Selected Readings in Latin Literature in Translation (3) Content varies; may be repeated with consent of department. A

5620 Problems in Old World Archaeology (3) (Same as Anthropology 5620.) A

Comparative Literature
H. C. Rutledge, Chairperson

4012-22-32 Special Topics in Comparative Literature (3, 3, 3) Content varies; may be repeated. F, W, Sp

4500-50-60 Dante and Medieval Culture (3, 3, 3) (Same as Italian 4500-50-60.) A, A

5012 Comparative Theories of Literature (3) Croce, Richards, Frye, Welles, and others. Prereq: Completion of three literature courses in foreign language along 300 of approval. F

5022 Approaches in Comparative Literature (3) French and American schools; "comparative literature" vs "general literature"; Van Tiegheam, Carre, Brown (6260), Welles, Prereq: 5012; completion of three literature courses in foreign language above 3000. or equivalent. W

5002 Studies in Comparative Literature (3) Independent research problems. Pre req: 5012 and 5022. Sp

Computer Science

MAJOR

Computer Science

DEGREE

M.S.

Professors:
R. T. Gregory (head), Ph.D. Illinois;
F. B. Halton, Ph.D. Texas; R. J. Piemons,
Ph.D. Auburn (Mathematics); G. R. Sherman,
Ph.D. Purdue (Research Computing Center).

Associate Professors:
R. M. Aiken, Ph.D. Northwestern; T. Feagin,
Ph.D. Texas (Aerospace Engineering);
R. C. Gonzalez, Ph.D. Jorida (Electrical Engineering);
E. L. Hall, Ph.D. Missouri (Electrical Engineering);
C. E. Hughes, Ph.D. Pennsylvania;
K. T. Haynes, Ph.D. Pennsylvania;
S. M. Selkow, Ph.D. Pennsylvania;
M. G. Thomson, Ph.D. Duke.

Assistant Professors:
C. P. Huang, Ph.D. New York (Buffalo);
S. R. Jordan, Ph.D. Wisconsin;
D. L. Matuszek, Ph.D. Texas; J. M. Moshell,
Ph.D. Ohio State; C. P. Plefier, Ph.D.
Pennsylvania State; D. W. Straight, Ph.D. Texas.

Instructor:
C. W. Thompson, M. A. Texas.

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. Mathematics: Knowledge equivalent to that of a student who has completed the calculus sequence through one year of multivariable calculus and matrix algebra.
2. Computer Science: 3155 or an equivalent introductory numerical algorithms course.
3. An introduction to probability and statistics at least at the level of Statistics 3450.
4. Computer Science 3175 or an equivalent introductory course in discrete structures and logical foundations of computer science.
5. Computer Science 3510 and 3620 or equivalent courses in advanced FORTRAN 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 4550 and 4510
2. Electrical Engineering 5615-25-35
3. Computer Science 4710, 4730, or 4225. The student may then select either Plan A or Plan B.

Plan A: Thesis Option

1. Completion of courses at the 4000 level or above, including at least 27 hours at the 5000 level, exclusive of Electrical Engineering 5615-25-35.
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 46 hours of courses at the 4000 level or above, including at least 27 hours at the 5000 level, exclusive of Electrical Engineering 5615-25-35.
2. Pass written and oral comprehensive examinations.

Under either plan, courses which are taken from a department other than computer science must have the approval of the Computer Science Department.

3150 Introduction to Numerical Algorithms and Programming: Roots of equations, systems of linear equations, least-squares data fitting, numerical integration, numerical methods for ordinary differential equations. Introduction to programming in FORTRAN and 3155 may not both be taken for credit. Students with a knowledge of FORTRAN should take 3155. Prereq or coreq: Mathematics 2200 or 2201.

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 no knowledge of FORTRAN should take 3155. Prereq or coreq: Mathematics 2200 or 2201.

3510 Computer Organization and Programming I (3) Problem formulation and advanced programming in FORTRAN; operation and control of digital computers. Prereq: 1510, 2510, 3150, or consent of instructor.


3715 Discrete Structures (2) Introduction to discrete structures useful in computer science. Sets, set logic, relations, functions, Proof techniques, induction, logic Graphical representations and algorithms. Prereq: 1510 or 1610 or 3150 or equivalents. Prereq or coreq: Mathematics 2200. (Same as Mathematics 3715.) F

3725 Advanced Discrete Structures (3) Advanced topics in discrete structures useful in computer science. Graphs and algorithms for manipulating data, analysis of algorithms, group theory, group, rings, monoids. Prereq: 3715 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, error bounds for floating-point computation, finite fields and exact computation using digital computers. Prereq: 3155. A

4225 Numerical Solutions to Equations and Numerical Approximations (3) (Same as Mathematics 4225.) F, W

4225 Numerical Methods for Ordinary Differential Equations (3) (Same as Mathematics 4225.) F, W, Sp

4245 Numerical Linear Algebra (3) (Same as Mathematics 4245.) F, Sp

4310 Statistical Data Processing (3) FORTRAN language for organization and analysis of scientific data. SPSS and SAS programs for standard statistical analyses; frequency distributions, percentages, data reduction correlation and regression analysis of variance. Not for credit for computer science majors. Prereq: Statistics 2200 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. Pre req: Consent of instructor. May be repeated. Maximum 9 hrs.

4340 Interactive Statistical Data Processing (3) Statistical data processing using interactive computer system. Timesharing utility and statistics packages; StatPack, editors, and FORTRAN. Not for credit for computer science majors. Prereq: Statistics 2200 or equivalent. F, Sp

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 experiment in LISP and either SIMULA, or LISP (4450). Prereq: 4510.

4510 Data Structures and Non-numeric Programming (3) Data structures and algorithms for their implementation. Arrays and trees, stacks, queues, rings, doubly-linked lists, trees, dynamic storage allocation; compilation of files, programming languages for information structures. Prereq: 2710 and 2160 or 2610.
4560 Systems Programming (3) Computer organization and advanced programming. Machine language and design of computers, representation of information, microprogramming, software systems, interactive systems, and implementation of compilers and macroassemblers. Prereq: 3520 or equivalent. E

4570 Data Base Management Systems (3) Hierarchical, network and relational models; logical and physical design, implementation, system enhancement, security, and backup. Prereq: Statistics 3450 or equivalent; or consent of instructor. W

4610 Operating Systems—Concepts and Facilities (3) Detailed examination of major operating system. Memory, processor, device, and data management. Interrupts, machine-level input-output, loaders and relocation, device characteristics, data sets organisation, SPOOLing. Prereq: 4510 and 4550. F

4620 Operating Systems—Case Studies (3) Alternatives in operating system design. Dynamic scheduling, paging, segmentation, time sharing, time slicing, protection, concurrency, real-time systems. Examples from different operating systems analyzed as appropriate. Prereq: 4610 or equivalent or consent of instructor. W

4660 Compiler Construction (3) Practical experience with a compiler. Types of languages and machines. Emphasis on regular and context-free languages. Introduction to computability and enumerability. Prereq: 3715. F, Sp


4750 Interactive Computer Graphics (3) Point plotting vector generation, interactive graphical techniques, two- and three-dimensional transformation, perspective depth, hidden line elimination, shading, software and hardware system design. Discussion of use of these techniques in design, problem solving, mapping, architecture, and many other areas. Prereq: Senior standing in Computer Science, Electrical Engineering or Geography and a knowledge of computer programming, or consent of instructor. (Same as Mathematics 4750.) F

4820 Introduction to Pattern Recognition (3) (Same as Electrical Engineering 4820) W

4830 Digital Image Processing (3) (Same as Electrical Engineering 4830) Sp

4860 Small Computer Systems (3) (Same as Electrical Engineering 4860) W

4910 Analysis and Management of Computer Information Systems (3) Analysis and design of computer systems; implementation, justification, personnel in systems, perspective on system. Prereq: 3520 or equivalent. W

4980-90 Special Topics in Computer Science (1-4, 4-15) Topics vary. May be repeated. Maximum 15 hrs.

5000 Thesis (1-15) E

5002 Non-Thesis Graduate Completion (3-15) Required for the non-thesis student not otherwise registered when such student studies university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. (S/C only.) E

5010 Computer-assisted Instruction (3) History and development of CAI systems. Emphasis on studying success and failure of major projects, future role of CAI in education. Students design, implement and evaluate a CAI course. Prereq: 3510 or consent of instructor.

5050 Computer Modeling and Simulation of Physical Systems. Techniques in modeling and simulation. Inputs, driving functions, errors, outputs, interactive simulations as applied to various disciplines. Applications to models to represent spatial relationships. Prereq: 3150 or 3155, and 3520 and Statistics 3450. A

5210 Artificial Intelligence (3) (Same as Mathematics 5210) Problem solving systems; representation, search, and manipulation for various areas: problem solving, game playing, pattern recognition, reasoning, information processing, Computer simulation of AI problems. Prereq: 4510 or consent of instructor. (Same as Electrical Engineering 5690) W

5250 Medical Computing and Artificial Intelligence (3, 3) (Same as Electrical Engineering 5250) Development of major components of compiler using constructs provided by formal language theory. Recognizers, symbol tables, semantic routines, allocation of storage, code optimization. Prereq: 4510, 4550, and 5750. 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 Advanced Data Base Management Systems (3) Data model theory, comparison of several existing data base systems, implementation techniques, selection and evaluation techniques, integrity, security, authorization and protection, hardware architecture, and software and hardware. Prereq: 4510 or equivalent. W

5575-65-75 Numerical Mathematics (3, 3, 3) (Same as Mathematics 5655-65-75) F, W, Sp

5670-80 Advanced Operating Systems (3, 3) Theory and analysis of operating systems. Synchronization and deadlocks. Analysis of operating systems using mathematical models, simulation, and hardware and software tools. Prereq: 4510 or equivalent or consent of instructor. Sp

5710 Finite Automata Theory (3) Finite-state sequential machines, formal languages, abstract machines, composition. Regular sets and regular expressions. Prereq: 3520 or equivalent. W

5710 Finite Automata Theory (3) Finite-state sequential machines, formal languages, abstract machines, composition. Regular sets and regular expressions. Prereq: 3520 or equivalent. W

5730 Computability and Computational Complexity (3) Computability and decidability; Turing machines and halting problem. Register machines. Recursive and recursively enumerable sets; partial and total recursive functions. Time and space bounded computations; the P vs NP problems. Prereq: 4710. Sp

5730 Theory of Formal Languages (3) Phrase-structure languages, their generators and processors. Type 0, 1, 2, and 3 languages; operations on languages and grammars; deterministic context-free languages. Theory of translation. Prereq: 4710. W


5910-20-30 Special Topics in Computer Science (1-6, 1-6, 1-6) 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 topics. Prerequisite: faculty guidance. Consent of instructor. May be repeated. Maximum 9 hrs.

1040-20-30 Readings in Asian Literature (4, 4, 4) Prereq: Mastery of intermediate level of Japanese, Chinese, or Arabic and consent of instructor.

1042 Selected Topics in Asian Studies (4) Content varies. May be repeated. Maximum 12 hrs.

1431-32-33-34 Advanced Chinese (4, 4, 4, 4) Taped language program. Prereq: 3531-32 or equivalent or consent of instructor. Must be taken in sequence.

1431-32 Advanced Japanese I, II (4, 4) Reading in grammar with extensive listening to spoken Japanese. Conversation, drill and composition practice with native speaker. Must be taken in sequence. Prereq: 3632 or equivalent.

1460 Senior Seminar on Pan-Africanism (4) Explores concepts and philosophers of Pan-Africanism and implication of this ideology for various societal institutions.

1460 Resource Materials in Black Studies (4) Introduction to basic references such as bibliographies, indices, and listings of audiovisuals in Afro-American history, African history, and children's literature. Prereq: 2010 or 2020 and consent of instructor.

1460 Research in Black Studies (4) Deals with Black experience and research process.

1460 Current Issues and Topics in Black Studies (3, 4) Issues and topics in area of Black Studies. Content and credit determined by instructor. May be repeated. Maximum 12 hrs.


1480 Afro-American Psychology (4) (Same as Psychology 4880)

1501 Foreign Study (1-12) See page 95.

1502 Off-campus Study (1-12) See page 95.

1503 Independent Study (1-12) See page 95.

1507 Linguistics (3) Content varies. May be repeated. Maximum 9 hrs.

1520-30 Historical Linguistics, Neogrammarian School, and Growth of Structuralism (3, 3) Traces development of scientific approach to linguistics from Jacob Grimm and Franz Bopp through nineteenth century. 4030—Traces change in linguistics.
and/or 6000-level courses in English, (5) evidence of proficiency in one foreign language at the final examination, and (7) a program of supervised teaching approved by the department.

THE DOCTORAL PROGRAM

The departmental requirement for the Ph.D. degree in English is completion of a minimum of three academic years of resident graduate study. This includes an advanced 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; and 12 hours for graduate credit at any level, including the 3000-4000 level. In addition, 9 (or 8) hours approved by the department must be taken for graduate credit in a subject or subjects other than English. Normally a student with the M.A. from another university may transfer at least 36 quarter hours.

After all, or most, of the course work has been taken and after the two language requirements have been satisfied, the student will take four preliminary comprehensive examinations, one in each of several areas divided as the department directs. Successful completion of these examinations will be followed by the writing of the dissertation and (or the equivalent) in English: 36 hours at the 6000 level; 24 additional hours at the 5000-6000 level; and 12 hours for graduate credit at any level. In addition, 9 (or 8) hours approved by the department must be taken for graduate credit in a subject or subjects other than English.

Normally a student with the M.A. from another university may transfer at least 36 quarter hours.

*1211 Written and Oral English for Foreign Students (6) Emphasis on grammar, syntax, 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 exempt from 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 all foreign students (graduates, undergraduates and transfer students) who are not exempt from 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.

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 hours of additional courses at the 5000-6000 level, and 12 hours at any level for graduate credit, including the 3000-4000 level.

For the degree of Master of Arts in College Teaching (M.A.C.T.) the requirements include (1) 45 quarter hours of courses in English, arranged for as the non-thesis M.A., (2) 2 hours in a special course designed for M.A.C.T. students, (3) 3 hours of a tutorial in the teaching of freshman classes, and (4) a thesis or 9 additional quarter hours of 5000-level courses in English, (5) evidence of proficiency in one foreign language at the final examination, and (7) a program of supervised teaching approved by the department.

*Not available for graduate credit.

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John C. Hodge Professor

Alumni Distinguished Service Professor
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>5101</td>
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<td>3, 3</td>
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<tr>
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representing surfaces, using geographic information systems. Recommended prerequisite: 3700 and knowledge of computer language. F

4730 Advanced Cartography (4) Map production from design through color proofs. Prerequisite: 3700, 4710, and 4720 or consent of instructor. W

4740 Remote Sensing: Types and Applications (4) Basic principles and uses of aerial and satellite remote sensing techniques. Emphasis upon value of various types of imagery for geographic interpretation and use. Prerequisite: Consent of instructor. W

4750 Interactive Computer Graphics (3) (Same as Computer Science 4750.)

5000 Thesis (1-19) E

5100 Colloquium in Geography (1) Discussion of departmental research, current literature, and general topics. Registration at each offering requires consent of resident graduate student. May be repeated. Maximum 8 hrs. S/N only. W, Sp

5101 Foreign Study (1-12) See page 95. E

5102 Off-campus Study (1-12) See page 95. E

5150 Introduction to Geographical Research (3) Aims of geographical research; survey of printed source materials; practice in effective presentation of research findings. F

5160 Geographic Concept and Method (3) Traditional and modern thought regarding nature, scope, problems, and methods of geography. A

5200 Special Problems in Geography (2-6) Reading and research on topics or problems of interest to individual students. Students must define topic and receive instructor's approval of study plan before registering for course. May be repeated with consent of instructor. E

5250 Topics in Historical Geography (3) Examination of trends, concepts and methods in historical geography. Prerequisite: 4240 or consent of instructor. May be repeated with consent of instructor. Maximum 9 hrs. F


5310 Topics in Regional Geography of the Unites States (3) Intensive analysis of problems and trends in one or more regions of United States, excepting regions studied in 5320 Topics in the Geography of the 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 economic geography. Prerequisite: 3430 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. Prerequisite: 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. Prerequisite: 3550 or consent of instructor. May be repeated with consent of instructor. F

5610 Topics in Climatology (3) Examination of trends, problems, and methods in modern climatology. Prerequisite: 3560 or consent of instructor. May be repeated with consent of instructor. F

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. Prerequisite: 4100 or consent of instructor. Sp

5740 Advanced Topics in Remote Sensing (3) Applied research using remote sensing and aerial and satellite remote sensing techniques for interpretation and mapping of geographic data. Prerequisite: 4740 or consent of instructor. Sp
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. A minimum of 3 years must be approved by the student's entire faculty committee and which will consist of one of the following:
   a. Demonstration by examination of a reading knowledge in one modern foreign language in which there is a significant body of geological literature.
   b. Completion of course 3030 in an appropriate foreign language with a B or better.
   c. Courses (minimum of 6 hours) at 3000 level or higher taken for undergraduate credit and completed with a B average in appropriate mathematics, statistics, or computer science courses. The courses must 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 a college undergraduate in an appropriate foreign language.

3160 Introduction to Earth Materials (4) Study of minerals and rocks. Laboratory includes both hand specimen and analytical methods of identification. Prereq: 1410. 2 hrs and 1 lab.

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. A

3210-20 Invertebrate Paleontology (4, 4) Systematic review of important invertebrate fossil groups. 3210—Porifera to Annelida, including echinoderms. 3220—Mollusca through lesser Chordata, including arthropods and echinoderms. 3230—Mollusca through lesser Chordata, including arthropods and echinoderms. May be taken separately or in sequence. Prereq: 3210. 2 hrs and 1 lab.

3250 Micropaleontology (4) Microscopic remains of animals and plants with special emphasis on stratigraphically important groups. Prereq: 3210 or consent of instructor. 3 hrs and 1 lab or field period.

3260 Paleobiology (4) Introduction to principles and materials of paleontology as applied to interpretation of earth history. Prereq: 3210. 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 tectonic environments in which they form. Laboratory emphasizes both hand specimen and microscopic study of important rock types. Prereq: 3180. 3 hrs and 1 lab. A

3330 Geology of East Tennessee (4) Lectures and field excursions. Prereq: 12 hrs of geology and consent of instructor.

3360 Stratigraphy-Sedimentation (4) Introductory study of stratigraphic principles and practices and of sedimentary processes and their interpretation in depositional environments. Prereq: 1420 and 3180. 3 hrs and 1 lab or field period. A

3370 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. A

3410 Principles of Ground Water Geology (3) Geologic principles of ground water occurrence and behavior of water. (Same as Water Resources Development 3410.) 2 hrs and 1 lab.

3415 Introductory Environmental Geology (4) Geologic principles involving earth environments and resources, and geologic parameters associated with their control and misuse. Prereq: 1420 or consent of instructor. 2 hrs and 2 lab or field periods.

3419 Quaternary Geology for Engineers (3) Erosional and depositional processes, landforms, ground water. Prereq: 2160 or equivalent. 2 hrs and 1 lab or field period.

4110 Principles of Economic Geology (4) Formation of mineral deposits. Prereq: 3180, 3370, or equivalent.

4115 Elementary Applied Geophysics (4) Basic principles of electrical, seismic, gravity and magnetics surveying. Recommended: 1420. Physics 2220 or 2320. 3 hrs and 1 lab.

4130 Sedimentology (4) Introduction to physical processes of sedimentation: transport of sediments and formation of sedimentary structures, river flows, waves, tides, and ocean circulation. Prereq: 3130. 3 hrs and 1 lab.

4230 Paleozoology (4) Principles of environmental analysis applied to fossil assemblages and associated lithologies. Prereq: 3260 or consent of instructor. 3 hrs and 1 lab.

4240 Paleobotany (4) Survey of fossil record of plants with particular emphasis on comparative morphology and evolutionary trends in major plant groups, and chronological succession and geographic distribution of past floras on earth. Prereq: 1420 or 2210. Botany 3010 or consent of instructor. (Same as Botany 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: 3260. Recommended prereq: 3520-20. 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: 3260 and 3350. 1 hr and 1 2-hr seminar.

4310 Geologic Mapping (4) Interpretation of maps and methods of field mapping. 12 hrs geology. 3 hrs and 1 lab or field period.

4331 Quaternary Geology of North America (4) Quaternary geologic processes, stratigraphy, sedimentation and paleoclimatic and paleoenvironmental reconstruction of glacial and unglaciated North America and oceans. Prereq: 1410, equivalent course, or consent of instructor. 2 2-hr lectures per week.

4332 Quaternary Paleontology (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-macrofossil identification, description of site stratigraphy and sedimentology. 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 (8) Five-week field course, first term summer quarter. Advanced undergraduates or first-year graduates in geology. Employs entire time of students. Prereq: To be submitted no later than and of fall quarter. 12 hrs geology and consent of instructor.

4460 Geologic Photography and Photogrammetry (4) Principles of terrestrial and aerial geologic photography, including photographic principles and practice, geometry of terrestrial and aerial photograph, and image interpretation. Prereq: 3370 or consent of instructor. 3 hrs and 1 lab.

4510 Principles of Geomorphology (4) Gradational processes acting on earth surface and landforms produced. Prereq: 1410-20 or equivalent. (Same as Geography 4510.) 3 hrs and 1 lab.

4550 Optical Mineralogy (4) Identification of nonopaque substances by immersion methods, using petrographic microscope.

4610 Principles of Geochernistry (4) Application of chemical principles to geologic problems. Emphasis on crytal chemistry and relation between basic atomic structure and distribution and behavior of elements in the earth's crust. Prereq: Chemistry 1110-20 or equivalent. Recommended: 3310.

4650 Mineral Phase Equilibria (3) Principles of phase chemistry and application of phase equilibria studies in rock-forming mineral systems as aid to understanding geologic processes and identification of rocks. Prereq: 4610 or consent of instructor.

4770 Evolution of Oceans and Continents (4) Introductory study of principles and events that have occurred in earth's crust with emphasis on modern concepts of continental drift and plate tectonics. Prereq: 4420.

4790 World Geology of Petroleum (4) Geologic and engineering aspects of petroleum deposits, methods of exploration and reserve assessment, geology and global distribution of known and potential reserves. Prereq: 1410 or equivalent and 3360 or equivalent.

4790 Uranium Deposits (4) Distribution, characteristics, and origin of different types of uranium deposits. Prospecting and evaluation of uranium deposits with special reference to domestic potential resources. Prereq: 4110 or consent of instructor. 3 hrs and 1 lab or field/semester period.

4810 Special Problems in Geology (1-4) Prereq: Consent of instructor. May be repeated. Maximum 4 hrs.

5000 Thesis (1-15) E

5069 Geochernistry of Ore Mineral Deposits (3) Study of ore deposits based on experimental, empirical, and theoretical approaches to ore geochernistry and mineralogy. Prereq: 4650 and 4110 or consent of instructor.

5069 Experimental Geochernistry Laboratory (1-3) Independent lab study of problem in geochernistry using lab techniques. Prereq: 5069. 1 hr and 1 lab.

5120 Geophysics—Gravity and Magnetic Methods (4) Potential methods, introduction to geodesy and paleomagnetism. Prereq: 4115, differential and integral calculus plus 3360 or equivalent. Advanced engineering mathematics desirable. 3 hrs and 1 lab.

5130 Geophysics—Seismic Exploration Methods (4) Seismic reflection and refraction methods, introduction to earthquake seismology and earth's interior. Prereq: 4115 or consent of instructor. 3 hrs and 1 lab.

5210-20 Special Problems in Geology (1-4, 1-4)

5290 Quaternary Problems (4) Interdisciplinary approach to interpretation of physical and biological phenomena directly or indirectly influenced by Pliocene glaciation. Prereq: Elements of geology (3 quarters) or consent of instructor. (Same as Botany 5290 and Zoology 5290.)

5310 Advanced Stratigraphy and Sedimentation (4) Integrated field-oriented study of sedimentary rocks, analysis of depositional environments, paleocurrents, and paleoeroepgraphic-paleoectonic setting. Prereq: 3360 or equivalent, 4110.

5340 Seminar in Local Stratigraphy (3) Stratigraphy of Knoxville area.

5350 Selected Topics in Geology (1) Presentation of graduate research, topics from current literature, and subjects of general interest. Registration restricted to full-time graduate students. S/NC only.

5820 Strata-bound and Stratiform Sulfide Deposits (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 2 lab/field/semester periods.

5830 Magmatic Mineral Deposits (4) Classification, distribution, characteristics and genesis of magmatic deposits related to magmatic processes. Magmatic segregation deposits of ultramafic-mafic association and porphyry Cu-Mo deposits. Prereq: 4110 or consent of instructor. 2 hrs and 2 lab/field/semester periods.

5840 Ore Petrology (4) Ore mineral assemblages by reflected light microscopy. Identification of ore minerals and interpretation of paragenesis from textures. Typical samples from different types of ore deposits, suite of choice. Prereq: 4110 and 4550, or consent of instructor. 2 2-hr labs.

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.

5915 Regional Geomorphology (4) Selected geomorphological-related areas, which have common elements such as history or development, related processes which have produced generally similar landscapes of landforms. May be repeated with consent of department. (Same as Geography 5915.)

6000 Doctoral Research and Dissertation (3-15) E *610 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 Geochimistry (3) Prereq: 4510 or consent of instructor.

NOTE: Registration for 6000-level courses may be repeated to a maximum of 9 hours credit. 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 oral exam is to prepare highly qualified college teachers. Students receiving the M.A. degree will 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 have a minimum of 81 quarter hours of course work beyond the Bachelor's degree in addition to 36 hours of doctoral research and dissertation. At least 45 quarter hours of the minimum must be taken in 5000 or 6000 course work. Of these 45 hours, a minimum of 18 hours must be chosen from the proseminar (5200) and the literary or philological seminars (6210-20-30-40-50-60 and 6310-20-30). 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 a fluid command of German, both oral and written, with a knowledge of two foreign languages, French and another language, such as Italian, Latin or Russian, appropriate to the field of research. A preliminary comprehensive examination, both written and oral, on German language and literature and the minor field or fields, must be passed before the student may be admitted to candidacy. The student will be examined on an extensive reading list which covers the whole range of German literature, and will be expected to show familiarity with major works of world literature. The candidate will be required to defend the dissertation in an oral examination, which will cover also the general area of the dissertation. Central emphasis is put on the doctoral dissertation as a final test of the candidate's scholarly qualifications.

The field of study is divided into (1) German literature and (2) German (or Germanic) philology or linguistics. A student may choose one of these fields, and the dissertation and seminar research topics will be chosen in accordance with the varying preferences and specific interests of the faculty. Detailed programs will be established in each case by the student's faculty committee.

3010-20-30 Elements of German for Upper Division and Graduate Students (3, 2, 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 students having completed elementary German E.

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 deadlines. Students opting to drop 4260, 3210-20, 3220-20, 3230-20 may appropriate amount of extra work above that required for 3 hrs. F; W; Sp
3240 Old Norse Literature in English Translation (3, 3) Selections of major sagas of Scandinavian kings, great Icelandic family sagas, and Vinland sagas, narrating discovery of America around year 1000. Mythology, historical and heroic poems of the Edda.
4110-20-30 Studies in Classical and Modern Writers (3, 3, 3) Content varies. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, or courses in English 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 English translation) or equivalent. May be repeated. Su
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 English translation). May be repeated. Su
4170 Theatrical German (1-3) Performance in one or more German plays. Prereq: Intermediate German or equivalent or consent of instructor. May be repeated with consent of department. W; Sp
4210-20-30 Studies in German Literary Types (3, 3, 3) Poetry, 4220—Drama; 4230—Narrative prose. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, 3210-20-30, 3310) or equivalent. A
4250 Introduction to Descriptive Linguistics (3) (Same as French, Russian, and Spanish 4250.) F
4260 Introduction to Historical and Comparative Linguistics (3) Linguistic change, protolanguages. Phonological and morphological change. Cultural, historical, sociological influences upon the development of language. 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 a modern or ancient language (exclusive of German and French 3010-20-30, courses in literature in translation, and general courses in Latin and Greek requiring no knowledge of these languages), or consent of department. (Same as French, Russian, and Spanish 4260.) W
4310-20 History of German Language (3, 3)
4610-20-30 German Civilization (3, 3, 3) Prereq: Intermediate German or equivalent. F; W; Sp
4620-30-30 Advanced Conversation and Composition (3, 3, 3) Prereq: 3000 or equivalent or consent of department. F; W; Sp
5000 Thesis (1-15) E
5101 Foreign Study (1-12) See page 95. E
5102 Off-campus Study (1-12) See page 95. E
5103 Independent Study (1-12) See page 95. E
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., M.A.T., or Ph.D. candidates, except those whose previous teaching experience warrants excuse from this requirement or who wish to pursue vocation other than teaching. F; W; Sp
5410-20-30 Medieval German Language and Literature (3, 3, 3) 5410—Introduction to Middle High German; 5420—Readings in Medieval German Literature. F; W; Sp
5500 Studies in German Literature (3) Content varies. May be repeated. Maximum 9 hrs. F; W; Sp
5510 German Humanism and the Reformation (3) A
5520 German Baroque Literature (3) A
5530 The Enlightenment and the Rococo (3) A
5540 German Classicism (3) A
5560 Goethe's Faust (3) A
5560 German Romanticism (3) A
5570 German Realism and Naturalism (3) A
5580 Modern German Literature (1889-1945) (3) A
5590 Modern German Literature (1945-Present) (3) A
5600 German Literary Theory and Criticism (3) W
5610-20-30-40-60 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. A
5720 Readings in Old Norse Prose (3) Intensive readings of Old Norse prose works. Icelandic saga as literature. A
5730 Readings in Old Norse Poetry (3) Intensive reading of Eddic poems as a literary genre and re-pository of ancient Germanic customs, legends, and mythology. A
6000 Doctoral Research and Dissertation (3-15) E
6100 Gothic (3) Phonology, morphology, and syntax of Gothic language. Relationship to Indo-European languages and other Germanic languages. Readings from Gothic Bible. A
6120-30 Old High German (3,3) 6120—Introduction—phonology, morphology, and syntax of Old High German of eight and ninth centuries. Dialects. Representative readings. 6130—Literature and Linguistics; prose and poetry of period from linguistic and literary point of view. Development of language, literature, and thought in German period. A
6140 Old Saxon (3) Phonology, morphology, and syntax of Old Saxon. Representative readings. A
6210-30-40-50-60 Seminar in German Literature (3, 3, 3, 3, 3, 3) May be repeated. E
6310-20-30 Seminar in German and Germanic Philology (3, 3) May be repeated. E

Russian
3010-20-30 Elements of Russian for Graduate Students and Seniors (3, 3, 3) For graduate students preparing for language examinations and seniors desiring knowledge of a second foreign language. Prereq: 2 yrs of some foreign language in college or consent of department. Undergraduate credit only. No credit for students having completed 1 yr of Elementary Russian.
3210 Nineteenth-century Russian Literature in English Translation (3-4) Realism and the novel; selections from works of Pushkin, etc. F
3220 Works of Leo Tolstoy in English Translation (2-4) War and Peace, Anna Karenina, and other works. W
3221 Works of F. M. Dostoevsky in English Translation (3-4) Crime and Punishment, Brothers Karamazov and other works. F or W
3222 Twentieth-century Russian Literature in English Translation (3-4) Russian modernism and literature under the sovets. Sp
3240 The Russian Drama in English Translation (3-4) Selections from works of Gorovoi, Gorkio, Pushkin, Gogol, Ostrovsky, Turgeney, Chekhov, and others. F
3250 The Works of Ivan Turgenev and Anton Chekhov in English Translation (3-4) Sp
3260 Russian Folklore in English Translation (3-4) Sp
3270 Russian Philosophical and Theological Thought (4) A survey of the development of philosophical and theological thought in Russia from the Middle Ages to the Revolution. Special emphasis on the expression of this thought in Russian literature and art. Prereq: 1 yr of Russian required. (Same as Philosophy 3270.)
4010 Selected Topics in Russian and East European Studies (3) Interdisciplinary seminar on selected topic using comparative approach.
4110-20-30 Studies in Major Russian Writers (3, 3, 3) Content varies. Pushkin, Lermontov, Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov and others. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, 3210-20-30, 3230-40-40-60-70, 3310 or equivalent. May be repeated. F; W; Sp
4240 Introduction to Descriptive Linguistics (3) (Same as German, French, and Spanish 4250.) F
4250 Introduction to Historical and Comparative Linguistics (3) (Same as German, French, and Spanish 4260.) W
4270 Introduction to Slavic Linguistics (3)
4310-20-30 Advanced Studies in Russian Language (3, 3, 3) intended primarily for students majoring or minoring in Russian who are interested in language and linguistics. Includes problems in morphology and syntax, stylistics and translation techniques, and history of Russian language as well as other special problems for advanced students of Russian. May be repeated. Maximum 9 hrs each.
4410-20-30 Directed Readings in Russian (3, 3, 3) intended primarily for students participating in program in Russian and East Europe Area Studies, course will involve individual study relating to student's major field. Prereq: 9 hrs of 3000 courses (exclusive of 3010-20-30, 3210-20-30-40-40-60-70, 3310 or equivalent.

Greek
See Classics

History
MAJOR DEGREES
History
History
M.A., M.A.T., Ph.D.

Professors:
L. P. Graf* (Head), Ph.D. Harvard; E. Y. Chmielnicki, Ph.D. Harvard; J. C. Danieli, Ph.D. Maryland; R. E. Duncan, Ph.D. California (Berkeley); G. Fink (Emeritus), Ph.D. Harvard; A. G. Haas, Ph.D. Chicago; Y. Hao, Ph.D. Harvard; W. H. Haskins, Ph.D. California (Berkeley); C. G. Jackson, Ph.D. Emory; J. M. Klein, Ph.D. Columbia; R. G. Landen, Ph.D. Boston.
Assistant Professors:
S. D. Becker, Ph.D. Case-Western Reserve; S. Bohstedt, Ph.D. Harvard; N. L. Brann, Ph.D. Stanford; S. C. Fanning (Visiting), Ph.D. Minnesota; S. J. Kleinberg, Ph.D. Pennsylvania; R. B. Rice, Ph.D. Harvard.

THE MASTER'S PROGRAM
Master of Arts—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 courses numbered 5300 or above. Total hours, including thesis—45.
Plan II: History 5240, and either 5250 or 5260; two M.A. reading courses; 12 additional hours 5300 or above, at least 2 of which must be 6000 level. Total hours—45. Plan I and Plan II require evidence of proficiency in one foreign language before the M.A. degree is granted.

* Distinguished Service Professor.
** Alumni Distinguished Service Professor.
MASTER OF ARTS IN
COLLEGE TEACHING

Course requirements include History 5240-50-60, 5271-72-73, and Continuing and Higher Education 5110. Students must spend one year as a graduate assistant and one year as a teaching assistant. Total hours, including thesis—60. Students seeking the MACT degree may substitute 9 quarter hours of
classroom teaching for 6 quarter hours of

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.
(c) Students from other institutions should have an M.A. degree and must be reviewed and approved by the Graduate Awards and Research Committee after their first year of work at The University of Tennessee.

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 of the required 9 quarters of residence work shall be under the supervision of the staff of

3. Language Requirements: Candidates must possess a reading knowledge of one foreign language and such additional languages as may be determined by the staff of the committee. Under normal circumstances, those specializing in European history will need two languages. The committee may also specify any other research tools, such as statistics, essential for

4. Preliminary Examinations and Final Examination: (b) By course work. Upon consultation with the advisor, a student may elect to

5. Dissertation and Final Examination: Original research forms the basis for the dissertation. After the dissertation has been completed, a final oral examination will be given on the dissertation in its historical context.

3060-70-80 History of Western Religious Thought and Institutions (3, 3, 3) (Same as Religious Studies 3410-70-80)
3140-60-80 History of England (3, 3, 3) 3140—To 1688. 3150—1689 through the Reform Bill of 1682. 3160—1832 to the present.
3311-21 History of Tennessee (3, 3) 3311—Eighteenth Century to Civil War Era. 3321—1865 to present.
3411-12-13 Renaissance and Reformation (3, 3, 3)
3411—Renaissance. 3412—Reformation 1517-1550. 3413—Catholic Reformation and Wars of Religion. (Same as Religious Studies 3411-12-13.)
3421-22-23 Early Modern Europe 1600-1815 (3, 3, 3)
3421—Seventeenth-century Europe. 3422—Ancient Regime. 3423—French Revolution and Napoleon.
3431-32-33 Nineteenth-century Europe (3, 3, 3)
3445-46 History of France (4, 4) 3445—To 1875. 3446—Since 1871.
3470-80-90 History of Russia (3, 3, 3) 3470—To 1801. 3480—Nineteenth Century. 3490—Twentieth Century.
3610-20 The American Colonies and the American Revolution (3, 3) 3610—Settlements to 1754. 3620—1754-1759.
3710-20-30 History of Germany (3, 3, 3) 3710—First Reich to 1713. 3720—Habsburg and Hohenzollern and Restoration of the Monarchy. 3730—From a unified to a divided Germany, 1890 to present.
3740 The City in Europe, ca. 1200-1900 (3) Survey of European urban growth with comparative examination of the major periods of urbanization of the thirteenth and nineteenth centuries. Emphasis on the relationship between demographic, economic and social foundations of cities and political and cultural development.
3751-52 Ancient Near Eastern Civilization (3, 3) 3751—Early and Middle Bronze Ages. 3752—Late Bronze and Iron.
3760-70 The Ancient World (3, 3) 3760—Greece. 3770—Rome.
3780-90 History of the Middle East (3, 3) 3780—Rise and spread of Islamic Civilization to the 16th Century. 3790—The impact of the West on the Middle East from the sixteenth century to World War I.
3795 Contemporary Middle East (4) Background of current problems in the area, from World War I to present.
3800 North Africa since 1830 (3) Morocco, Algeria, Tunisia, and Libya in the nineteenth and twentieth centuries.
3810-20 History of Asia (3, 3, 3) 3810—Traditional China and Japan, ancient to midnineteenth century. 3820—Modern China, Japan, and mid-nineteenth century to 1920s. 3830—Contemporary China, Japan, and Korea, 1920s to present.
3870-80-90 History of Latin America (3, 3, 3) 3870—Exploration, conquest, settlement and Colonial life to 1800. 3880—Major countries of South America, 1800 to present. 3890—Mexico, Central America and the Caribbean, 1800 to present.
4015 Studies in History (3-4) Variable content course offering opportunity to offer subject matter not covered in an existing course. May be repeated.
4120-30 History of Colonialism and Imperialism (3, 3) 4120—Background; age of discovery and exploration to nineteenth century. 4130—Nineteenth century to the present.
4250-60-70-80-90 European Intellectual and Cultural History (3, 3, 3) 4250—From Reformation to the Scientific Revolution. 1500-1700. 4260—From the Enlightenment to the Age of Revolution, 1780-1870. 4270—From Subjectivism to Relativism, 1870-1914.
4280 Women in European History (4) Comparative analysis of role and image of women in Medieval, Renaissance, and Victorian periods. Attention given to parallel changes in structure of family as well as relationship between Western culture and women’s protest movements.
4290 Women in American History (4) Approaches of 4290 applied to American Society.
4310-20-30 History of American Foreign Relations (3, 3, 3) 4310—Recent (1910-Recent) to 1914. 4320—1914-1941. 4330—1941 to present.
4360 The United States in World War II (4) Diplomatic, and domestic experience.
4370 U.S. Military History, 1775 to the Present (4) Examination of national military strategy and means used to attain them, shifting strategy, tactics and weaponry involved in wars, and relationship between American society and its armed forces.
4380 Civilian-Military Relationships in the Modern World (3) Civilian-military affairs since about 1900 to 1960 in Western Europe, Russia and America, emphasis in Western Europe: e.g., Dreyfus Affair, Army in Nazi Germany, and Truman-MacArthur controversy.
5015 Periods in European History (3) May be repeated. Maximum 9 hrs.
5101 Foreign Study (1-12) See page 95. E
5102 Off-campus Study (1-12) See page 95. E
5103 Independent Study (1-12) See page 95. E
5211-5225 M.A. Reading Courses (3 hrs each) Directed reading courses in preparation for fields required in the M.A. oral examination. 5221, Ancient; 5212, Medieval; 5213, Early Modern Europe; 5214, Europe Since 1789; 5215, American History to 1815; 5216, American History Since 1789; 5217, Latin America; 5218, Far East; 5219, Colonialism and Imperialism; 5221, England; 5222, Russia; 5223, Germany; 5224, France; 5225, Middle East. Open only to Master's candidates in history. S/NC only. E
5240 Introduction to Historical Research (3) Principles and techniques of research in the study of history. Required of all candidates for advanced degrees who do not present evidence of similar training elsewhere. F
5250 European Historiography (3) Introduces the student to the historical literature of leading European nations. W
5260 American Historiography (3) Like 5250 in the American field. W
5271-72-73 The Teaching of College History (0, 0, 3) Introduction to the practice of teaching at college level. Place of history in curriculum, types and levels of courses, and techniques of teaching. Prereq: Consent of instructor. Required of candidates for the MACT. Credit will be withheld until the completion of 5273, with grades of "S" or "NC" submitted at end of each of first two quarters. E
5280 Philosophy and Methodology (3) Philosophies of history and their relationship to miliex from which they emerge; modern trends in historical methodology. Sp
5290 Quantitative Analysis of Historical Data (3) Prereq: Sociology 5220 and 5330, 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. F
5360 Topics in American Foreign Relations (3)
5410 Topics in Early Modern European History (3)
5440 Revolution and Restoration in Central Europe, 1780-1830 (3) Reform, revolution, and the advent of Liberalism and Nationalism. F
5444 Topics in French History (3)
5445 Topics in Nineteenth-century European History (3)
5450 Topics in Twentieth-century European History (3)
5480 Topics in Russian History (3)
5510 Topics in Tudor-Stuart England (3)
5520 Topics in Modern English History (3)
5550 Reaction and Reform in England, 1789-1848 (3)
5560 Anglo-Irish Relations (3)
5580 Topics in American Social and Cultural History (3)
5585 Topics in American Urban History (3)
5590 Topics in African History (3)
5595 Topics in American History (3)
5680 Topics in the Early National Period of American History (3)
5685 Topics in the American Westward Movement (3)
5690 Topics in the Early Republic (3)
5700 Topics in Renaissance England (3)
5705 Topics in the American Revolution (3)
5710 Topics in the Early Republic (3)
5715 Topics in the Civil War Era (3)
5720 Topics in Twentieth-century American History (3)
5730 Topics in Medieval History (3)
5740 Topics in European Urban History (3)
5750 Topics in Ancient History (3)
5760 Topics in German National Socialism (3)
5770 Topics in Middle Eastern History (3)
5780 Topics in Andean History (3)
5790 Topics in Mexican History (3)
5800 Topics in Chinese History (3)
5840 Topics in Japanese History (3)
5910-20 Topics in Southern History (3, 3) 5910—Old South, 5920—New South.
6000 Doctoral Research and Dissertation (1-15) E
6210-20-30-40 Directed Readings (3, 3, 3, 3) Individual readings directed toward preparation for preliminary examination fields. Open only to candidates for Ph.D. degree who are in residence and who have been in residence at least two quarters. Only one course may be taken in preparation for each of four fields. Depending on field in which he/she is reading, student will be assigned to appropriate member of department. S/NC only. E
6310 Seminar in Special Studies (3)
6350 Seminar in Tennessee Diplomatic History (3)
6410 Seminar in Western Europe (3)
6444 Seminar in Japanese 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)
6630 Seminar in Early National Period of American History (3)
6635 Seminar in Jacksonian Period (3)
6640 Seminar in Social and Cultural History of the United States (3)
6650 Seminar in the American Westward Movement (3)
6710 Seminar in Medieval Institutions (3)
6770 Seminar in Central European History (3)
6810 Seminar in Latin American History (3)
6910 Seminar in the Civil War Era (3)
6930 Seminar in Twentieth-century America (3)
6940 Seminar in the History of the South (3)
Note: Registration in topics and seminar courses may be repeated for credit with consent of department.

Latin
See Classics

Mathematics
MAJOR DEGREES
Mathematics M.M., M.A., M.S., Ph.D.
Professors:
L. K. Barrett (Head), Ph.D. Pennsylvania; G. E. Albert (Emeritus), Ph.D. Wisconsin; J. S. Bradley, Ph.D. Iowa; J. H. Carruth, Ph.D. Louisiana State; R. E. Cline, Ph.D. Purdue; A. J. Davermer, Ph.D. Wisconsin; D. F. Dessart, Ph.D. Maryland; E. D. Davies (Emeritus), Ph.D. Texas; H. Frandsen, Ph.D. Illinois; A. D. Gardiner, Ph.D. North Carolina State; R. T. Gregory, Ph.D. Illinois; T. G. Helam, Ph.D. Missouri; D. B. Hinton, Ph.D. Tennessee; A. S. Householder (Emeritus), Ph.D. Chicago; L. H. Husch, Ph.D. Florida State; R. M. McConnel, Ph.D. Duke; H. T. Mathews, Ph.D. Turano; D. D. Miller, Ph.D. Michigan; R. F. Plemons, Ph.D. Auburn; K. C. Reddy,* Ph.D. Indian Institute of Technology (India);

*Space Institute, Tullahoma.
3320, 3330, 3510, and 3720, are intended
K. R. Stephenson, Ph.D. Wisconsin; R. H. Hanks, Ph.D. Minnesota; M. Miller, Ph.D. Illinois; K. V. A. Dougalis, Ph.D. Chicago; V. Alexiades, Ph.D. SUNY. The first option requires a Science degree are designed to prepare

118

THE MASTER'S PROGRAM

Applicants for admission to this program must meet the following departmental requirements:

1. Pass an intensive examination in the field of specialization. This exam will be given by a committee appointed by the department head at some time after the requirements in 1. have been met. A student may take this specialty exam only twice.

2. The conditions for the doctoral degree are to include a demonstrated proficiency in one foreign language, normally from among French, German, or Russian; this requirement is to be met prior to the examination in the area of specialization. The student's doctoral committee may require that the student pass a second language exam.

In addition, the department requires that each student take a one-year, 6000-level course in mathematics outside of his/her area of concentration. The use of the course selected to fulfill this requirement must be approved by the department head and either the student's supervisory committee or the student's Doctoral Committee. (Such approval may occur after completion of the course.)

The written exams mentioned in 1. are normally given twice a year, one in the fall and once in the spring. The fall exams usually are given before the fall quarter begins, and the spring exams are given during the spring quarter.

**3500 Elementary Probability and Statistical Analysis** (3) Combinatorial problems; sample spaces, sets, and events; statistical independence; axiomatic probability theory; random variables and their distributions, expectation, random processes. Prereq: 1550-60 or equivalent. W, Sp

**3090 Polynomials and Rings** (3) 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 theoretic properties shared by integers and polynomial rings over certain fields. Prereq or consent of instructor. Sp, Su

**1100 Logic and Sets** (3) Elements of mathematical logic; elementary algebra of sets. Primarily for students in the College of Education. Prereq: 1 yr of college mathematics. Su

**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.


**3150 Introduction to Numerical Algorithms and Programming** (3) Same as Computer Science 3155. E

**3155 Introduction to Numerical Algorithms** (3) Same as Computer Science 3155. E

*These courses are sometimes offered in special summer institutes for an 8-week period with 4 hrs credit. Such special courses are designed 3001, 3061, etc.
3220 History of Mathematics (3) Survey of development of various branches of mathematics, from ancient to modern times. Prereq: 1860 or 2550 or equivalent.

3310 Advanced Euclidean Geometry (3) Triangles and circles, constructions, modern concepts. Prereq: 1 yr of college mathematics.

3320 Non-Euclidean Geometry (3) Foundations of geometry. Elliptic, hyperbolic plane geometry. Prereq: 1 yr of college mathematics.

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.

3510 Intermediate Analysis (3) Primarily for students in secondary mathematics education. Course covers elementary calculus from advanced viewpoint with emphasis on proofs of basic theorems. Topics covered include limits of sequences and functions, continuous functions, derivatives, definite integral, and fundamental theorem of integral calculus. Prereq: 1560-50 or 1860.

3715 Discrete Structures (3) (Same as Computer Science 3715.) E

3720 Theory of Equations (3) Techniques for finding roots of polynomial equations. Topics covered include complex, integral, and rational roots, multiple roots, extreme values (Sturm's theorem), and Horner's method of approximating roots, and formulas for quadratic, cubic, and biquadratic equations. Prereq: 1 yr of college mathematics.

3725 Advanced Discrete Structures (3) (Same as Computer Science 3725.)

3780-90 Introduction to Combinatorial Theory (3, 3) Introduction to problems of arrangement and selection within discrete systems. Enumeration by recurrence relations and generating functions, graph theory, finite geometries and finite fields, partitions, block designs. Prereq: 2860 or consent of instructor. F; W; W; or W; 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. Coreq: 2850 or 2550. E

3920-30 Topology of Euclidean Spaces (3, 3) Topics will include topology of line and plane, separation properties, compactness, connectedness, completeness, continuous functions, homeomorphisms, continua, and topological invariants. Must be taken in sequence. Prereq: 3810, 2868, or consent of instructor. W, Sp

3900 Studies in Mathematics (1-4) Credit determined at registration. Prereq: Consent of instructor. May be repeated with consent of department. Maximum 9 hrs.

4050 Matrix Algebra and Applications (3) Matrices, elementary operations, systems of linear equations, vector spaces, determinants, eigenvalues and eigenvectors. Prereq: 2850 or 2560 or consent of instructor. E

4060-70 Matrix Algebra and Applications (3, 3) Eigenvalues and eigenvectors, singular values and singular vectors, unitary similarity transformations, quadratic forms, vector and matrix norms, Jordan forms, and related topics. Prereq: 2860 or 4050. W; W

4120 Linear Algebra (3) Abstract vector spaces, linear transformations, their matrices, systems of linear equations, determinants, inner products, and diagonalization of symmetric matrices. Prereq: 2860 or 4050. F

4150-60 Abstract Algebra (3, 3) Equivalence relations, properties of integers, elementary theory of groups and rings, polynomial rings, integral domains, divisibility, unique factorization domains. Prereq: 2860 or 4050. 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 equations; power and inverse power methods for eigenvalues. Approximation by polynomials, piecewise polynomials, trigonometric and rational functions, numerical solutions to differential equations. Prereq: 2860 or 4050. (Same as Computer Science 4225.) F, W


4250 Elementary Complex Variables (3) Complex numbers, Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula. Taylor and Laurent series. Prereq: 2860. one 4000-level mathematics course recommended. F, Sp, Su

4510-20-30 Introduction to Analysis (3, 3, 3) Real numbers, limits, continuity, uniform continuity, differentiation, integration. Functions of several variables, implicit function theory. Multiple infinite series, sequences and series of functions, uniform convergence, Taylor series. Should be taken in sequence. Prereq: 2860. F; Sp; W

4540 Infinite Series and Functions of Several Variables (3) General theory, power series and Taylor's formula, uniform convergence. Partial differentiation and maxima and minima for functions of several variables. LaGrange multipliers. Prereq: 2860.

4550 Partial Differential Equations (3) Fourier series; Fourier integrals; orthogonal functions; the vibrating string, solution by series; heat flow. Bessel functions. Prereq: 2860. Recommended: 4610 or 4710. E


4650-60-70 Introduction to Mathematical Statistics (3, 3, 3) Introduction to probability; discrete and continuous distributions; moments; functions of random variables; multivariate normal distribution; sampling distribution; central limit theorem. Prereq: 2860 or 4050. W; Sp; Sp; or Sp.

4710 Vector Analysis (3) Fundamental operations, basis vectors, dot and cross products, directional derivatives, divergence and curl of vector fields, line and surface integrals, the integral theorems of Gauss, and Stokes's theorem. Prereq: 2860. E

4750-60-70 Introductory Probability Theory (3, 3, 3) Elementary combinatorial analysis, probability distributions, conditional probability and stochastic independence, binomial, Poisson, hypergeometric and normal distributions. 4760- Introduction to expectation and characteristic function of random variables, infinite sequences of random variables, the weak and strong laws of large numbers, and the central limit theorem. 4770—Markov chains; limiting probabilities; steady state and stationary distributions; stochastic processes; Poisson, birth and death processes; Kolmogorov equations. Prereq: 2860 or 4610. F, W, Sp

4810 Elementary Number Theory (3) Divisibility; congruences; theorems of Fermat and Wilson. Prereq: 1 yr of college mathematics. Prereq: 2860 or consent of instructor. Su

4990 Readings in Mathematics (1-3) Open to superior students with consent of department head. Independent study and faculty guidance. May be repeated. Maximum 9 hrs.


5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Prereq: 1 yr of college mathematics. May be registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N only. E

**5011 Elementary Functions from an Advanced Standpoint for Teachers (3-4) Order and completeness axioms of real numbers, limits of sequences, derivatives of functions of one variable, limits of sequences and series of exponential, logarithmic and trigonometric functions. Power series, Taylor and Maclaurin's series; applications to construction of logarithmic and trigonometric tables. Prereq: 3510 or 3110 or consent of instructor.

**5012 Differentiation Geometry for Teachers (3-4) Advanced techniques applied to graphing functions. Curves, surfaces, parametrizations, singular points; tangents and normals; osculating and curvatures; arclength of curves in plane and curves on surface, curvature, torsion, asymptotes, local coordinates, Frenet formulas. 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 metric; 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, limits and continuity, partial derivatives, directional derivatives, gradients and gradient, implicit function theorem, maxima and minima, transformations. Prereq: 3510 or consent of instructor.

**5015 Probability and Statistical Inference for Teachers (3-4) Probability distributions including binomial, hypergeometric, and Poisson; moment generating functions; expectation of continuous random variables; moment generating functions of uniform and normal distributions. Sampling including Chi-square, F, and t distributions, interval estimation of means and variances; simple hypothesis testing. Prereq: 1 yr of calculus and 3050 or consent of instructor.

5050-60-70 Mathematical Logic (3, 3, 3) Truth functions; syntax and semantics of some propositional theories. Gentzen's sequence-calculus and the problems of natural deduction; algorithmic logic; syntax and semantics of first order theories; elementary model and recursion theory; consistency, completeness, decidability.

5051 Introductory Business Mathematics (3) Graphing of simple equations, straight lines, circle, parabola, functions, algebra of functions, limits, continuity, derivatives, limits of sums and products, calculation of maxima and minima, convexity and concavity, implicit differentiation, change of higher derivatives, and applications. Credit applies only to

This course is intended for students in the Master of Mathematics program and for students in graduate programs in education. It may not be applied as graduate credit toward the M.A. or M.S. degree in Mathematics.
satisfy MBA core requirement. Prereq: Math 1550 or equivalent.

5052 Mathematics for Business Decisions (3) Exponential function, applications to growth and decay. Credit available only to satisfy MBA core requirement. Prereq: Math 1550 or equivalent.

5455 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; boundary value problems. Prereq: 5110 or 5130. May be repeated with a change of content. Credit available only to satisfy MBA 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 mapping; integral tables, integration by parts, reduction formula, Cauchy’s integral formula, Taylor and Laurent series, analytic continuation. Credit available only to satisfy MBA core requirement. 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 geometry, projective transformations; conics and quadrics. Elliptic and hyperbolic geometry from viewpoint of projective geometry. Prereq: 5210. Must be taken in sequence.

5370-90-90 Mathematical Principles of Fluid Mechanics (3, 3, 3) Equations of motion, incompressible flows, flows of compressible perfect gases, 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, strong and weak extremum, necessary and sufficient conditions for extremum—Euler’s equation. Variational problems in parametric form, functions depending on higher-order derivatives. Boundary conditions. Extremum of integrals, Legendre’s condition, conjugate points, Jacobi’s necessary condition, asymptotic expansion for weak extremum. Prereq: 4510-20-30 and 4610. Su

5450-60-70 Introduction to Partial Differential Equations (3, 3, 3) Linear second-order equations in two independent variables: elliptic, hyperbolic, and parabolic equations, separation of variables, and Fourier series, nonhomogeneous problems, problems in higher dimensions, multiple Fourier series, Fourier and Laplace transforms. Prereq: 4510-20-30 and 4610 or consent of instructor. F, W, Sp: A

5785 Real Algebraic Geometry (3) Real varieties, algebraic sets, real algebraic subsets; equivalence relations; existentially closed sets; real closed fields; real spectrum; and valuation theory. The real spectrum of the ring of real polynomials. The principal ideal theorem. The simplicity of the real spectrum. The Hahn-Banach theorem. The separation and connectedness theorems. The tame case. Prereq: 5210. May be repeated with a change of content. Credit available only to satisfy MBA core requirement. Prereq: Math 5051 or equivalent.

5780-72-74 Theory of Probability and Mathematical Statistics (3, 3, 3) Probability spaces, random variables, expectation, characteristic functions, moment generating functions, limiting distributions, central limit theorem, laws of large numbers. Prereq: 5110 or 5130. May be repeated with a change of content. Credit available only to satisfy MBA core requirement. Prereq: Math 5051 or equivalent.

5850-70-75 Introduction to Ordinary Differential Equations (3, 3, 3) Existence, uniqueness, extendability, continuity of solutions; linear equations, power series, Frobenius methods for regular singular equations; Foppan-Bendixson theory, stability of critical points; boundary value problems for linear systems; regular and singular perturbation theory for nonlinear systems. Prereq: 4610, 4050, 4510-20-30, F, W, Sp

5890-20-30 Elementary Topology (3, 3, 3) Topological spaces; metric, homeomorphic invariants of point sets; structure of Peano continua. Mapping; homotopy; introduction to combinatorial topology. F, W, Sp, A

5960 Graduate Reading in Mathematics (1-3) Open to graduate students with consent of department. Independent study with faculty guidance. May be taken for credit or no credit.

599 Seminar (1-3) Seminar. Prereq: Consent of instructor.

5995 Seminar Applied Mathematics (1-3) May be taken for SNC or letter grade.

NOTE: Registration for seminars may be repeated with consent of department.

6000 Doctoral Research and Dissertation (3-15) E


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.

6510-20-30 Modern Algebra (3, 3, 3) Intensive study of some major topics in modern algebra. Subject matter will vary according to interests and preparation of students. Prereq: 5510-20-30.

6540-50-60 Theory of Semigroups (3, 3, 3) Congruences and homomorphisms; ideal theory; representations, decompositions of operators and extensions; free, regular, inverse, simple, and completely simple semigroups. Prereq: 5520.

6707 Theory of Groups (3) Structure of groups, free groups, homomorphisms and homomorphism series, subgroup, quotient groups, permutation groups, abelian groups. Prereq: 5520.

6710 Advanced Ordinary Differential Equations (3, 3, 3) Theory of ordinary differential equations from advanced viewpoint. Topics from current
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; D. W. Bitner, Ph.D. Cornell; D. A. Brian, Ph.D., R. J. Courtney, Ph.D. Syracuse; R. V. Miller, J. M. Woodward, Ph.D. Kansas; C. J. Wust, B. T. Rouse, Ph.D. Guelph (Canada); J. O. Murn, Ph.D. Michigan State; W. S. Rigby, Ph.D. Yale; B. T. Rous, Ph.D. Guelph (Canada); M. D. Bos, Ph.D. Sydney; M. S. M. Bailey, Ph.D. Sydney; D. D. Dyer, Ph.D. Washington University; B. H. L. Looke, Ph.D. Arizona State; R. W. Renwick, Ph.D. Yale; W. Pass, Ph.D. Duke; B. L. Looke, M.D. Buenos Aires; C. L. Looke, M.D. Buenos Aires; R. W. Tenent, Ph.D. Georgia Tech.

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, and 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 bacteria associated with food fermentation and food spoilage. Prereq: 2910 or 3519. Coreq. 3810. Sp

3820 Yeast and Molds (3) Morphology, taxonomy, and physiology of yeasts, actinomycetes, and fungi of industrial importance. Prereq. 2910 or 3700, or consent of instructor. W

3829 Yeasts and Molds Laboratory (2) Laboratory methods for examination and cultivation of yeasts and molds. Prereq. 2919 or 3519. Coreq. 3820. W

4110 Physiology of Bacteria (3) Modern concepts of bacterial physiology and metabolism including cell structures and function. Prereq. 3700 and 12 hrs of organic and inorganic chemistry. With emphasis on anaerobic and general chemistry. Not for degree credit in microbiology. Su

5310 Selected Topics in Microbiological Research (3) Literature surveys and laboratory methods for development and interpretation of microbiological research. May be repeated.

5350 Advanced Microbiology for Secondary Education (4) Major bacterial populations encountered in natural habitats; laboratory methods for isolation and characterization of naturally occurring microorganisms. Prereq. Consent of instructor and I. B. Miller, Ph.D. Cornell. W

5441-42-43-44-45-46 Clinical Microbiology (6, 6, 6, 6) Six quarters, 6 quarter hrs each consisting of lectures and clinical laboratory experience. Enrollment by consent of instructor. W

6510-20-30 Problem Research (3, 3, 3) Research projects with student guidance. S/NC only.

5720 Microbiological Physiology (3) Lectures and seminars dealing with current advances in bacterial physiology including growth and cell structure. Prereq. Biochemistry 4110-20.

5730 Pathogenesis of Infectious Disease (3) Host response to infection. Enumeration of host-microorganism interactions following a single infection. Prereq. Biochemistry 4110-20.

5750 The Oncogenic Viruses (3) Lectures and seminars dealing with current advances in viral oncology. Prereq. 4430 or consent of instructor. W

5760 The Bacterial Viruses (2) Lectures and discussions dealing with current advances in virology. Prereq. Consent of instructor. W

5819 Molecular Genetics Laboratory (3) Principles and methods of research in molecular genetics. Fundamental genetics concepts (mutation, recombination, protein and RNA synthesis). May be repeated with consent of instructor. W

5820 Microbiology of Foods (3) Lectures and seminars dealing with current advances in food microbiology. Prereq. Consent of instructor. May be repeated. S/N only. E

5850 Seminar in Microbiology (1) Specific topics chosen from current literature. Prereq. 4430 or consent of instructor. W

5910-20-30 Seminar (1-3) Readings and discussions based on current literature. May be repeated with consent of department. S/N only.

6000 Doctoral Research and Dissertation (3-15) E

6310 Seminar in Immunology (1) Readings and discussions based on current literature. May be repeated. S/N only. E, W

6320 Seminar in Microbial Pathogenesis (1) Readings and discussions based on current literature. May be repeated. S/N only. E

6330 Seminar in Microbial Physiology (1) Readings and discussions based on current literature. May be repeated. S/N only. E

6340 Seminar in Microbial Genetics (1) Readings and discussions based on current literature. May be repeated. S/N only. E

6350 Seminar in Virology (1) Readings and discussions based on current literature. May be repeated with consent of department. S/N only.

6580 Seminar in History of Microbiology (1) Microbiologists and their achievements from Pasteur to present. S/N only.

6610-20-30 Seminar in Microbiology (1-3) Readings and discussions based on current literature. May be repeated with consent of department. S/N only.


6810-20-30 Topological Algebra (3, 3, 3) Topics chosen from topological semigroups, topological groups, Lie groups; transformation groups; topological lattices; relations in topological spaces; topological rings, fields, algebras. Prereq or coreq. 5810-20-30.

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 (3, 3, 3) Homology, cohomology, and homotopy theories. Homology and cohomology groups, the Eilenberg-Moore axioms, cap and cup products, duality theorems, homotopy equivalence, higher homotopy groups, fiber spaces, spectral sequences. Prereq. 4160 and 5920.

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.
THE MASTER OF MUSIC PROGRAM

Voice: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 9 hours in vocal pedagogy, and (d) 6 hours in recital or lecture-recital, (e) 3 hours in ensemble, and (f) 12 hours in elective (excluding language and ensemble).

Piano: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 9 hours in piano literature and/or pedagogy, (c) 3 hours in music research, (d) 6 hours in music theory, (e) 3 hours in recital, (f) 6 hours in music history/literature, (g) 3 hours in recital, and (h) 3 hours in music electives.

Piano Literature: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 12 hours in piano literature and/or pedagogy, (c) 3 hours in music research, (d) 6 hours in music theory, (e) 3 hours in ensemble or accompanying, (f) 6 hours in music history/literature, and (g) 6 hours in music electives.

Strings: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 9 hours in area literature and/or pedagogy, (c) 3 hours in research techniques, (d) 6 hours in ensemble, (e) 3 hours in theory, (f) 3 hours in recital, and (g) 12 hours in music electives.

Wind and Percussion Instruments: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in area literature, (c) 3 hours in music research, (d) 3 hours in advanced conducting, (e) 3 hours in music theory, (f) 9-15 hours in ensemble, (g) 3 hours in recital, and (h) 9-12 hours in music electives.

Composition: 45 hours distributed as follows: (a) 9 hours in applied composition, (b) 3 hours in music research, (c) 15 hours in music theory, (d) 6 hours in music history/literature, (e) 9 hours in thesis, and (f) 3 hours in electives.

Music Theory: 45 hours distributed as follows: (a) 3 hours in music research, (b) 3 hours in music research, (c) 6 hours in music history/literature, (d) 9 hours in thesis, and (e) 9 hours in electives.

Choral Conducting: 45 hours distributed as follows: (a) 6 hours in conducting, (b) 6 hours in choral literature/techniques, (c) 3 hours in music research, (d) 9 hours in theory, (e) 6 hours in ensemble, (f) 3 hours in choral conducting performance or document, and (g) 12 hours in electives.

Suzuki String Techniques: 45 hours distributed as follows: (a) 12 hours in applied music, (b) 6 hours in Suzuki literature/techniques, (c) 3 hours in music research, (d) 9 hours in music theory, (e) 3 hours in recital, (f) 6 hours in ensemble, and (g) 12 hours in electives.

THE MASTER OF ARTS PROGRAM

Music Theory: 45 hours distributed as follows: (a) 18 hours in theory, (b) 3 hours in music research, (c) 9 hours in music history, and (d) 6 hours in electives.

MUSIC: 45 hours distributed as follows: (a) 21 hours in music history/literature, (b) 3 hours in music research, (c) 6 hours in theory, (d) 9 hours in thesis, and (e) 6 hours in electives.

A reading knowledge of French or German must be demonstrated by candidates for the Master of Arts degree.

In addition to the above requirements all students must complete a comprehensive examination on the major's area of concentration. The examination will be planned by the student under the direction of the appropriate faculty advisor and will be approved by the student's advisor. The examination will consist of three parts: a written component, an oral component, and a performance component. The written component will consist of a written examination of 100 points, consisting of a research paper on a topic of the student's choosing and an essay on a topic chosen by the faculty advisor. The oral component will consist of a dissertation defense, in which the student will present a defense of their research and an oral examination, conducted by the faculty advisor, which will cover the student's entire area of concentration. The performance component will consist of a performance on the student's instrument, in which the student will perform a piece of their choosing, with a faculty advisor.

The comprehensive examination will be administered at the end of the term in which the student is scheduled to complete their degree requirements. The examination will be given in May, June, and July of each year. Students who do not pass the comprehensive examination will have the opportunity to retake the examination in the following term. The examination will be administered by the Department of Music and will be graded on a pass/fail basis.

The Department of Music offers the following degrees: Bachelor of Music, Master of Music, Master of Arts in Music, and Doctor of Musical Arts. The requirements for each degree are detailed below.

DEGREES

The Bachelor of Music degree is awarded to students who complete the requirements for the major in Music. The requirements for the Bachelor of Music degree are as follows:

1. Completion of all general education requirements.
2. Fulfillment of all major requirements.
3. Completion of all required electives.

The Master of Music degree is awarded to students who complete the requirements for the major in Music. The requirements for the Master of Music degree are as follows:

1. Completion of all general education requirements.
2. Fulfillment of all major requirements.
3. Completion of all required electives.
4. Completion of a comprehensive examination.

The Master of Arts degree is awarded to students who complete the requirements for the major in Music. The requirements for the Master of Arts degree are as follows:

1. Completion of all general education requirements.
2. Fulfillment of all major requirements.
3. Completion of all required electives.
4. Completion of a comprehensive examination.

The Doctor of Musical Arts degree is awarded to students who complete the requirements for the major in Music. The requirements for the Doctor of Musical Arts degree are as follows:

1. Completion of all general education requirements.
2. Fulfillment of all major requirements.
3. Completion of all required electives.
4. Completion of a comprehensive examination.
5. Fulfillment of all requirements for the Doctor of Musical Arts degree.

The Department of Music offers the following areas of concentration: Music History/Literature, Music Theory, Music Education, Music Performance, and Music Industry.

The Department of Music offers the following courses: Theory, Analysis, Performance, Composition, Conducting, Research, and Electives.

The Department of Music offers the following degrees: Bachelor of Music, Master of Music, Master of Arts in Music, and Doctor of Musical Arts.
4115 Variation (3) Study and application of variation procedures. Prereq: 3123 or equivalent.

4116 Set Structure in Musical Composition (3) Theory of sets and its application to analysis of music. Prereq: Consent of instructor.

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.

4210 Music in the Romantic Period (3) Survey of music from Beethoven through post-Romantic instrumental and vocal styles.

4230 Contemporary Music: 1945 to Present (3) Survey of new and avant-garde music in Europe and America since World War II.

4241 American Music (3) American music from colonial times to present. Emphasis on twentieth century. Includes folk and cultivated traditions. Prereq: 1210-20 or equivalent.

4261-71 Introduction to Ethnomusicology (3, 3) Basic attitudes and techniques of ethnomusicology. Survey of music cultures throughout the world, including Asian, African, Pacific, Near East and Asia, 2471—Africa, Europe and Americas.


4290 Gregorian Chant (3) Chants of Latin rite. Masses and Officium examined as functional music as well as by type.

4310 History of Art Song (3) Survey of art song from the fifteenth century to 1930.

4315 Wind Chamber Music (3) Study of wind chamber music from the eighteenth through twentieth centuries. Emphasis placed on style interpretation, rehearsal techniques, programming and musical significance, both historical and theoretical.

4340-50 Works of Bach (3, 3) Detailed examination of sonatas, chamber, keyboard, and orchestral works; cantatas, motets, passions and oratorios. 4340-instrumental works; 4350—vocal works.

4400 Jazz Directing (1) Rehearsal techniques for jazz and combo groups. Development of band techniques, library systems, programming, and super-learning laboratory experience in rehearsing university jazz ensembles. Prereq: Enrollment in Applied Music with jazz emphasis or consent of instructor.

4480 Jazz Pedagogy (1) Methods and materials relating to teaching of jazz and administering of jazz programs. Prereq: Required in Applied Music with jazz emphasis or consent of instructor.

4580 Jazz Composition (3) Prereq: Music 4114 and consent of instructor.

4600 Advanced Improvisation (2) Emphasis on further development of individual skills and solving individual problems in jazz improvisation. Prereq: 3052-53.

5000 Thesis (1-15) E


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

*5910 Organ Literature Seminar (3) Topics vary. Prereq: Consent of instructor.

5012-22-32 Pedagogy of Voice (2, 2, 2) 5012—Survey of voice production processes in singing including: voice classification, quality, diction regis- ter, phonation, pitch control, and control. 5022—Examination of teaching materials, preparation of programs for various vocal categories and levels of study, observation of studio teaching, and analysis of the vocal problems of a selected group of students. Supervised teaching. Prereq: 4012-22-32 or consent of instructor.


*5030 Choral Literature Seminar (3) Topics vary.

*5040 Vocal Literature Seminar (3) Topics vary.

5050 Graduate Recital (3)

5051 Opera Performance (3)

5052 Vocal Chamber Music Performance (3)

5053 Choral Conducting Performance (3)

5054 Lecture-Recital (3)

5055-56 Practicum for Instrumental Conductors (1, 1) Intern experience in choral music and in an instrumental field other than the area of major interest. S/NC only.

5057 Instrumental Conducting Seminar (2) Rehearsal and performance problems and techniques allied to score reading and preparation. Particular attention to individual problems. Prereq: 4500 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: 4500 or equivalent.

5070 Opera Production (1-3) Prereq: Consent of instructor.

5080 Instrumental Conducting Performances (1) Jury performance, conducting band or orchestra in public.

*5090 Special Topics in Performance (1-3) Prereq: Consent of department head.

5100 Independent Study in Music Theory (1) Prereq: Consent of department head.

5111 Advanced Harmony (3) Analytic survey of harmonic trends in compositions from 1700 to present. Exercises employing and illustrating these techniques. Prereq: Consent of instructor.

5114 History of Music Theory (3) Work and contributions of theorists from ancient Greece to present. Emphasis on 1600 to present. Prereq: Consent of instructor.

5116 Musical Styles (3) Elements of design and their role in definition of musical styles. Exercises in aural and visual identification. Prereq: Consent of instructor.

5121 Analytical Techniques (3) Analytical techniques with emphasis on contemporary approaches. Tonal and neotonal music. Prereq: Consent of instructor.

5125 Practicum in Computers and Music Research (3) Programming languages, design and implementation of projects in musical analysis, composition and indexing. Prereq: Consent of instructor.

*5150 Seminar in Music Theory (3) Topics vary. Prereq: Consent of instructor.

*5200 Independent Study in Music History and Literature (1-3) Prereq: Consent of department head.

5210 Introduction to Music Research (3) Principles and techniques of research. Required of all candidates with concentrations in musicology or in music theory. Recommended for all music students who intend to enroll in a doctoral program.

5220 Music Bibliography (3) Bibliographic methods; illustrative projects in information retrieval and problem solving in music.

5270 Seminar in Musicalology (3) Topics vary. Prereq: Consent of instructor.

5315 Band Literature (3) Band literature and origins of band emphasizing its important, expanded cultivation during past century in United States and Europe.

5350 Music in the Middle Ages (3) Emphasis on early Christian chant, medieval secular song, early theory, and the development of polyphony and musical notation.

5352 Music in the Renaissance (3) From 1400 to 1600. Mass, motet, chanson, madrigal, and other vocal and instrumental forms and genres.

5353 Music in the Baroque Period (3) From 1600 to 1750; rise of opera and oratorio, church and secular cantata, instrumental forms, performance practice.

5355 Music in the Classic Period (3) Preclassic music (Rococo) and music of Haydn, Mozart and early Beethoven. Includes background of other cultural and artistic activities.

5400 Musical Aesthetics (3) Nature of music and musical experience, sense perception and emotions, value in music, and role of artist in society. Aesthetic viewpoint of individuals and historical eras through selected writings.

*5500 Flute (1-4)

*5505 Oboe (1-4)

*5510 Bassoon (1-4)

*5515 Clarinet (1-4)

5520 Saxophone (1-4)

5525 Horn (1-4)

5530 Trumpet (1-4)

5535 Trombone (1-4)

5540 Baritone (1-4)

5545 Tuba (1-4)

5550 Percussion (1-4)

5555 Voice (1-4)

5560 Violin (1-4)

5565 Viola (1-4)

5570 Cello (1-4)

5575 String Bass (1-4)

5580 Piano (1-4)

5585 Harpsichord (1-4)

5590 Organ (1-4)

5595 Guitar (1-4)

5597 Composition with Electronic Media (1-3) Prereq: Consent of instructor. May be repeated. Maximum 9 hrs.

*5599 Composition (1-3) Prereq: Consent of instructor.

*5600 Small Ensemble (1)

*5602 Brass Choir (1)

*5604 Jazz Ensemble (1)

*5606 Trombone Choir (1)

*5610 Percussion Ensemble (1)

*5611 Marimba Choir (1)

*5612 Baroque Ensemble (1)

*5620 UT Singers (1)

*5630 Chamber Singers (1)

*5632 Collegium (1)

*5634 Saxophone Choir (1)

*5640 Opera Theatre (1)

**5642 Opera Workshop (1)

*5650 Concert Band (1)

*5652 Campus Band (1)

*5654 Varity Band (1)

*5656 Laboratory Band (1)

*5657 Marching Band (1)

*5670 Symphony Orchestra (1)

*5680 Concert Choir (1)

*5682 University Chorus (1)

*5684 Campus Chorus (1)

*5686 Men's Glee Club (1)

*5687 Women's Chorale (1)

*5699 Accompanying (1)

*May be repeated.

**May be repeated. Maximum 6 hrs.
Philosophy

MAJOR Philosophy M.A., Ph.D.

Professors:  J. W. Davis (Head), Ph.D. Emory; B. Edwards, Ph.D. Emory; M. H. Moore (Emeritus), Ph.D. Chicago; D. Van de Vate, Jr., Ph.D. Yale.

Associate Professors: J. D. Bennett, Ph.D. Tulane; S. H. Cohen, Ph.D. Nebraska; K. A. Emmett, Ph.D. Ohio State; W. J. Fowke, Ph.D. Northwestern; H. P. Hamin, Ph.D. Georgia; R. Jones, Ph.D. Chicago; M. L. Osborne, Ph.D. Tennessee; S. Reaven, Ph.D. California (Berkeley).


THE MASTER'S PROGRAM

See general requirements on page 19. Courses below 4000 may not be taken for graduate credit by philosophy majors except with special permission.

THE DOCTORAL PROGRAM

Specific requirements for doctoral students in Philosophy include a minimum of three academic years of graduate study involving at least 72 quarter hours credit in course work (normally 24 quarter courses or their equivalent, exclusive of credit for the thesis and dissertation) of which not less than 45 should be in courses numbered over 5000, and of which at least 9 shall be in a subject other than philosophy. The specific number and distribution of courses will be determined by the student's faculty advisor.

Two foreign languages, normally French and German, are required. As an alternative to the two-language requirement, candidates for the Ph.D. may elect to demonstrate a substantially more advanced proficiency in reading knowledge of one language. Requirements for this option may be obtained in the department office.

Registration in any course in the 5000 or 6000 series (except 5050 and 5910-20) may be repeated for credit with the consent of the department. That is, courses having the same number, but with different subject matter, may be taken with each separate subject description.

MEDICAL ETHICS

The department has an M.A. and Ph.D. program of graduate study with a concentration in medical ethics. Details concerning the program can be obtained from the department.

RELIGIOUS STUDIES

The department has an M.A. program of graduate study with a concentration in philosophy of religion and other religious studies. Details concerning the program can be obtained either from the Departments of Philosophy or Religious Studies.

3111 Ancient Western Philosophy (4) F, W
3121 Medieval Philosophy (4) F, Sp
3131 Seventeenth- and Eighteenth-century Philosophy (4) E
3141 Nineteenth- and Early Twentieth-century Philosophy (4) F, Sp
3151 Contemporary Philosophy (4) Survey of recent movements in philosophy. F
3270 Russian Philosophical and Theological Thought (4) (Same as Religious Studies 3270 and Russian 3270).

3311-12 American Philosophy (4, 4) 3311-Colonial to late nineteenth century. 3312-Late nineteenth century to present. W, Sp
3320 Philosophy of Law (4) Nature, sources, function of legal institutions. (Same as Religious Studies 3650.) F
3330 Philosophy of History (4) Speculative and critical aspects of the philosophy of history. A
3410 Philosophical Ideas in Literature (4) Philosophical assumptions and implications in major literary works. (Same as English 4432.) F
3420 Philosophy of Literature (4) Study of the nature, functions, values and epistemic principles of literary arts. A
3430 Concepts of Woman (4) Examination of some of the theoretical foundations of feminism and antifeminism. F, W, Sp
3440 Social Ethics (4) Ethical theory as related to politics, economics, law, religion and the family. F
3510 Existentialism (4) E
3550 Marxism as Philosophy (4) W
3560 Philosophy and Religion in India (4) (Same as Religious Studies 3660.) F
3560 Buddha Philosophy and Religion (4) (Same as Religious Studies 3660.) W
3671 Religion and Philosophy in China (4) (Same as Religious Studies 3661.) F
3690 Philosophy of Religion (4) Analysis of basic issues of religion. (Same as Religious Studies 3690.) F, Sp, Su

3740-50 Conceptual History of Science (4, 4) 3740-The Scientific Revolution: historical evolution of thought in astronomy, mechanics and philosophy of nature up to Newton. 3750-The development and decline of Newtonian science: historical evolution of thought on the nature of matter and of light, and on that of life. Prereq: 8 hrs of physical science or consent of instructor. F, W
3770 Introduction to Philosophy of Science (4) Standard topics in philosophy of science: scientific method, nature of laws and theories, problems of induction, explanation, measurement. No background in logic presupposed. F
3810 Introductory Symbolic Logic (4) Techniques for formal analysis of deductive reasoning (propositional logic and quantification theory.) Sp
3910 Contemporary Aesthetics (4) Philosophical discussion of contemporary art. F, W, Sp
4000 Special Topics (4) A student- or instructor-initiated course may be offered at convenience of department. Subject matter to be determined by mutual consent of students and instructor with approval of department. Prerequisites to be determined by department. May be repeated.
4111-21 Modern Religious Philosophies (4, 4) (Same as Religious Studies 4111-21.)
4310 Intermediate Ethics (4) Topics in metaphysics or ethics. Sp
4370 Theoretical Issues in Medical Ethics (4) Prereq: 3130 or 3611 or consent of instructor. (Same as Religious Studies 4370.) Sp
4410 Plato (4) Prereq: 8 hrs philosophy or consent of instructor. A
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. (Same as Religious Studies 4480.) F
4610 Philosophical Analysis (4) Prereq: 8 hrs philosophy or consent of instructor.
4620 Philosophy of Mind (4) Problems of mind and body in relation to consciousness and personal identity. Prereq: 8 hrs philosophy or consent of instructor.
4630 Philosophy of Language (4) Prereq: 8 hrs philosophy or consent of instructor.
4710 Philosophy of Natural Science (4) Consideration 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 science.
4810 Metaphysics (4) Prereq: 8 hrs philosophy or consent of instructor.
5000 Thesis (1-15) E
5050 Symbolic Logic (4)
5080 Philosophy of Logic (4) Nature of logic; epistemology, metaphysics and axiomatical assumptions and implications in various theories of logic. Prereq: 4510 or equivalent.
5101 Foreign Study (1-12) See page 95. E
5102 Off-campus Study (1-12) See page 95. E
5103 Independent Study (1-12) See page 95. E
5110-20-30-40-50-60 Studies in the History of European Philosophy (4, 4, 4, 4, 4, 4) Intensive critical work on major philosopher or school. 5110—Greek, 5120—Hellenistic or Medieval, 5130—Modern, before Kant, 5140—Kant, 5149—Nineteenth Century, 5150—Twentieth Century.
5250 Studies in the History of American Philosophy (4) Intensive, critical work on major philosopher or school.
5310-20-30 Studies in Value and Normative Theories (4, 4, 4, 4) 5310—Ethics and metaphysics. 5330—Aesthetics.
5355 Orientation to Medical Ethics (4) Survey of ethical theories in application to issues in medical ethics. (Same as Religious Studies in 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 political fields. (Same as Religious Studies 5365.) W
5370 Topics in Medical Ethics (4) Prereq: 4370-71 or consent of Medical Ethics Committee.
5375 Clinical Practicum Orientation (4) Medical terminology, history of medical ethics; preparation for UI Center for the Health Sciences Clinical Practicum. Sp
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 examine 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.
5550-60 Philosophy of Science (4, 4) Nature of sub sciences and methodology of sciences, 5550—Natural sciences, 5560—Social Sciences.
5610 Recent Developments in Philosophy of Religion (4)
have completed an undergraduate major in physics or its equivalent. Physics 3210-20-30, 3710-20-30 or 4110-20-30, 4210-20, 4230 or 4240 constitute the minimum course work prerequisite to graduate study.

A student who intends to present Physics as a graduate minor shall, in general, have completed an undergraduate minor in Physics or its equivalent. Physics 3210-20, 4210-20 constitute the minimum course work prerequisite to graduate study.

Graduate programs leading to the degrees of Master of Science and Doctor of Philosophy are offered in a number of specialized fields including chemical physics, elementary particle physics, atomic and low temperature physics, health physics, molecular spectroscopy, nuclear physics, plasma physics, solid state physics, theoretical physics, ultrasonics, heavy ion atomic physics, biophysics, and liquid state physics.

Departmental graduate programs in atmospheric and space flight are available at the Space Institute, Tullahoma.

All first-year graduate students are required to take a comprehensive examination in undergraduate physics during the fall quarter registration period.

The Physics Department has two Master's degree programs—thesis and non-thesis.

The thesis program is primarily designed for students intending to go into industrial or governmental laboratories as physicists. The course requirements include 36 quarter hours in such courses as Physics 4510-20-30, 5110-20-30, 5210-20-30, 5610-20-30 and appropriate courses in related fields. Each candidate must present an acceptable thesis, equivalent to 9 hours of credit, and pass an oral examination on course material and thesis.

The non-thesis program is primarily designed for students intending to teach in colleges or universities on the elementary or intermediate level, or for students specifically intending to seek employment using their 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 27 hours from courses numbered above 5000 (e.g., 5110-20-30, 5210-20-30, 5310-20-30); 9 hours in a minor field (e.g., mathematics); and 9 hours from other courses in physics numbered above 4000 (preferably of advanced 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 2240; 1440 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 selected from the following 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 Ph.D. program leading to the Ph.D. in chemical physics is conducted jointly with the Chemistry department, which offers a similar degree. Physics departmental requirements for the degree in chemical physics include the successful completion of: Physics 4410, 4610, 5410, 5510, 5610, 5710, 5720; Chemistry 4160-70, 5430, and any two courses from 5430-50, 6730 or 6810-20.

Astronomy


Physics


3230 Heat and Thermodynamics (3) Concepts of temperature and heat; laws of thermodynamics; applications of laws to simple physical and chemical problems. Prereq: 2220 or 2230 and calculus; 3210-20 or consent of instructor. F, Sp. Prereq: 3210-20 or 2210-20-30, and either 3510 or 3520; Chemistry 4160-70, 5430, and any two courses from 5430-50, 6730 or 6810-20.


3510-20-30 Physical Measurements (3, 3, 3) Laboratory measurement of some physical quantities. Theory and methodology: 3 hours of supervised work; 6 hours of laboratory work. Prereq: 3210-20-30 or 2210-20-30, and calculus; 3510 for 3520 and 3530. Labs.

3610-20 Electronics (3, 3) Electronic components and circuits of interest to physicists. Prereq: 3110-
radiated solids; techniques in electron spectroscopy; applications to dosimetry. Prereq or coreq: 610-20-30. W

6630 Interaction of Radiation with Matter (3) Topics in atomic collision theory. Photon-molecule interactions; electron-molecule collisions, dielectric theory, stopping power, collective excitations in electronic systems; Cherenkov radia-
tion, electronic transport in gases and solids. Prereq or coreq: 610-20-30. W

6710-20-30 Advanced Solid State Physics (3, 3, 3) Lattice dynamics; phonons. Brillouin zones; heat capacity. Energy band structure of solids; cohesives energy, work function. Crystal oscillator strengths; effective mass approximation. Dia-, para- and ferro-

6810 Vibration Problems in Molecular Spectra (3) Normal coordinates and potential functions; group theoretical methods and selection rules in gases and condensed phases. Laseranam spectoscopy and nonlinear electrooptical phenomena. Prereq: 5420 or equivalent. (Same as Chemistry 6810.)

6820 Molecular Vibration-Rotation Theory (3) Molecular rotation and vibration and rotating systems pos-

The Presidency and Congress within framework of American Political economy. 1. A minimum of 117 quarter hours, including 54 hours of graduate courses, is required. 2. At least fifty percent of the credit hours must be in approved courses numbered 5000 or above. 3. Admission to candidacy shall be based on written and oral preliminary examinations, or both. 4. The completion of 54 quarter hours of graduate courses must be in approved courses numbered 5000 or above. The specialized track developed by the student with the approval of the coordinator of the M.P.A. program. The specialized track will comprise 30 quarter hours of core courses which focus upon general perspectives, analytical skills, and management skills, a recommended internship arranged with a cooperating public agency (9 quarter hours), and 15 quarter hours in an elective specialized track developed by the student with the approval of the coordinator of the M.P.A. program. The specialized track will often contain a mix of courses from political science and one or more outside fields; examples include general government, public health administration, fiscal administration, administration of criminal justice, urban administration, environmental and natural resources administration. Inquiries concerning all programs should be directed to the Department of Political Science, Knoxville, Tennessee 37916.

THE DOCTORAL PROGRAM

Specific requirements for the degree of Doctor of Philosophy in Political Science include:

1. A minimum of 117 quarter hours, following the Bachelor's degree, is required. At least 93 hours shall be in political science. At least 72 hours in political science will be graduate level hours (i.e. earned in 5000- or 6000-level courses). At least 45 of these graduate level hours shall be at the 6000 level. This figure includes 36 hours of credit for the dissertation.

2. Each Ph.D. candidate must pass an examination in one foreign language. Students specializing in special areas may be required to demonstrate knowledge of a second language or appropriate research tools or both.

3. Admission to candidacy shall be based on written and oral preliminary examinations which must be passed not later than three quarters before the date on which the degree is granted.

4. The candidate must pass a final oral examination on the doctoral dissertation.

5. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.

5355 Minority Group Politics in the United States (4) Content varies with quarter. Prerequisite: Consent of department. Maximum 8 hrs. W

5356 Introduction to Public Administrative Organization and Management (4) Organization and decision-making theory, line and staff services, poli-
tics of organizational leadership, personnel and fiscal management, administrative responsibility. Rec-

Masters in Public Administration

Specific requirements for graduation include:

1. The completion of 54 quarter hours of approved graduate courses.

2. At least fifty percent of the credit hours must be in approved courses numbered 5000 and above.

3. Demonstration of command of the material covered in course work through a written comprehensive examination which may be followed by an oral examination.

The 54 quarter hours of graduate courses comprise 30 quarter hours of core courses which focus upon general perspectives, analytical skills, and management skills, a recommended internship arranged with a cooperating public agency (9 quarter hours), and 15 quarter hours in an elective specialized track developed by the student with the approval of the coordinator of the M.P.A. program. The specialized track will often contain a mix of courses from political science and one or more outside fields; examples include general government, public health administration, fiscal administration, administration of criminal justice, urban administration, environmental and natural resources administration. Inquiries concerning all programs should be directed to the Department of Political Science, Knoxville, Tennessee 37916.

Doctoral Program

Specific requirements for the degree of Doctor of Philosophy in Political Science include:

1. A minimum of 117 quarter hours, following the Bachelor's degree, is required. At least 93 hours shall be in political science. At least 72 hours in political science will be graduate level hours (i.e. earned in 5000- or 6000-level courses). At least 45 of these graduate level hours shall be at the 6000 level. This figure includes 36 hours of credit for the dissertation.

2. Each Ph.D. candidate must pass an examination in one foreign language. Students specializing in special areas may be required to demonstrate knowledge of a second language or appropriate research tools or both.

3. Admission to candidacy shall be based on written and oral preliminary examinations which must be passed not later than three quarters before the date on which the degree is granted.

4. The candidate must pass a final oral examination on the doctoral dissertation.

5. Successful completion of the degree also depends on course performance and other evidence of professional interest and conduct.

3545 United States Constitutional Law: Sources of Power and Restraint (4) Analysis of judicial review, constitutional powers of President and Congress, federalism, sources of regulatory authority, and constitutional protection of political rights. Rec-

3620 Modern Latin American Government and Politics (4, 4) Sp

3632 Contemporary and Political Science (4, 4) W

F; W, Sp

3710 State Politics (4) Focus on formal and informal setting of state government; governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy. F

3720 State Government and Policy Making (4) Nature and functions of the institutions of state government; governors, courts, legislatures, and state administrators. Attention will be paid to state government's role in formulating, enacting, and implementing state policy. W

3750 The Urban Polity (4) Analysis of political in-

760 Urban Policy Process (4) Analysis of urban problems and policies in metropolitan areas. Sp

3796 Contemporary Problems of Soviet Foreign Policy (4) Sp

3801 Studies in Ancient Political Thought (4) Clas-

ical Greek and Roman political thought. F

3802 Studies in Medieval Political Thought (4) From Augustine to Luther: emphasis on problems and theories of religion and politics. W or Sp

3803 Studies in Early Modern Political Thought (4) Machiavelli through Locke. W

3804 Studies in Nineteenth- and Twentieth-century Political Thought (4) Political theories of industrial and technological societies; nineteenth and twen-
tieth century. Sp

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 (4) Characteristics, theories, and consequences of revolution, with particular focus on left-wing revolutions and movements. Sp

4410 Law and the Administrative Process (4) Powers of, procedures of, controls over administrators. Sp

4535-36 Political Attitudes, Opinions and Com-
munication (4, 4) Nature, development, formation and distribution of political attitudes, values and opinions; role of leadership, persuasion, and communication in opinion-policy process. F, W

4540-50 Presidency, Congress and Public Policy (4, 4) Presidential and congressional role within framework of policy-making process. W; Sp

4545-46 The Judicial Process (4, 4) The study of courts as components of political systems, and public policy formulation through judicial decision mak-
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 (3) Development of the merit system in government, career systems, public personnel management functions, organization for personnel management. F or W.

4665-56 Policy Making in Democracies (4, 4) Comparative approach to theory and process of making public policies. F or Sp; W.

4701-02 International Organization (3, 3) Analysis of problems in international relations with emphasis upon realism, foreign assistance, trade, and economic integration. Sp. A.

4701-02 International Law (4) Introduction to international relations with emphasis upon realism, foreign assistance, trade, and economic integration. Sp.

4775 Special Topics in Comparative Government and Politics (4) May be repeated with consent of department. Maximum 8 hrs.

4701-02 International Organization (4, 4) 4701-The public policies. For Sp; W.

4701-02 International Law (4) May be repeated with consent of department. Maximum 8 hrs.

4701-02 International Organization (4) 4701-The public policies. F or Sp; W.


4831-32 The Systematic Study of Politics (4, 4) Scope, methods and procedures of analysis in political science; intended primarily for seniors intending to pursue graduate work and entering graduate students who have not had such a course. F; W.

4875 Special Topics in Political Thought (4) May be repeated with consent of department. Maximum 8 hrs.

4940 Politics and the Environment (4) Examination of political and administrative perspectives. Topics dealing with problems of air and water pollution and policies relating to physical environment with emphasis upon scientific enterprise. Sp.

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student utilizes 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 Foreign Study (1-12) See page 95. E.

5012 Off-campus Study (1-12) See page 95. E.

5013 Independent Study (1-12) See page 95. E.

5102-20 Seminar in Political Theory (3, 3) Selected topics dealing with political problems of less developed countries. F.

5109-20 Seminar in Comparative Government (3, 3, 3) Selected topics in modern governments.

5340-50 Seminar in Latin American Government (3, 3, 3) See page 95. E.

5410 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 processes. W.

5510-20 Seminar in International Organization (3, 3) 5510-Introduction to international organizations; political integration at the international level. 5520-Operational research methodology. W.

5540 Seminar in Comparative Public Administration (3) Approaches to and methods used in comparative analysis.

5550 Seminar in Administration in Developing Countries (3) The public policies. F.

5600 Public Administration (3) Public administration theory and functions, approaches to public management, contemporary problems in public administration.

5605 Research and Methodology in Public Administration (3) Basic assumptions and techniques of research in public administration; measurement, analysis, and evaluation. Sp.

5610-20 Seminar in Organization Theory (3, 3) Appraisal of major theories of organization and their applicability to public sector. F.

5611-21 Seminar in State-Local Administration (3, 3, 3) The public policies.

5630 Seminar in Technology and Public Policy (3) Technological change and policy process, government interactions with scientific community, political characteristics of scientific enterprise.

5635-45 Operations Research for Public Administrators (3, 3) Applications and limitations in public sector; linear programming, transportation and assignment problems, network analysis, PERT, dynamic programming and other methods.

5640-50-60 Seminar in Metropolitan Areas (3, 3, 3) The public policies.

5641 Seminar in Contemporary Public Policies (3) Problems in one or more public policy areas from political and administrative perspectives. Topics selected by instructor.

5670-90 Seminar in Policy Analysis (3, 3) Role of administrators in policy analysis and decision making with special attention to historical and current issues. Sp.

5710 Seminar in the Politics of Administration (3) Examination of public administration in context of American political system with emphasis upon policy making and political roles of public administrators and agencies. W.

5730 Seminar in Public Budgeting and Fiscal Management (3) Budgetary process, financial management, and finance in American government. Sp.

5740 Seminar in Organizational Analysis (3) Organization theory applications in public management; field analysis of public organizations.

5750-65 Seminar in Public Management (3, 3) Selected problems. F.

5765-75 Law and the Administrative Process (3, 3) Constitutional position; decisional processes, regulation and management; limitations on governmental action; questions of structure, role, and administrative choice. W.

5770 Practicum in Public Administration (3) Sp.

5785-86 Seminar in Staff Functions (3, 3) Functions of administrative staff personnel serving political executives, public bureaucracies, legislative bodies, and advisory and community groups in public sector. Selected topics include budgeting, personnel, evaluation, and other staff functions.
The Psychology Department emphasizes doctoral degree programs with specializations in clinical, school, community, 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, 1206 Foster Building, University of Tennessee, Knoxville, Tennessee 37916.

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.

4107 Experience in Individualized Instruction (1-6) PreReq: Consent of instructor. May be repeated. Maximum 12 hrs. E

4120 Topics in Social Psychology (4) Intensive and selective research topics. Prereq: 3120 or Sociology 3130 (Same as Sociology 4120).

4230 Sensory Processes and Perception (4) Survey of sensory and perceptual processes with emphasis on audition and vision. Prereq: 3150. Recommended: 2520. F

4329 Laboratory in Sensory Processes and Perception (2) Prereq or coreq: 4230. F, W, Sp

4460 Organizational-Industrial Psychology (3) Conditions taken for credit by students who have credit for Management 3460. E

4510 Personality Theories (4) Prereq: 3650. F, Su

4520 Personality and Social Systems (4) Prereq: 2540.

4610 Group Processes (3) Study and experience of theory and techniques of group processing and facilitation. Those participating in 4610 are expected to continue into 4620 and 4630. Prereq: 3618 and consent of instructor. F

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 intelligence, personality, special abilities, and educational achievement. Prereq: 3150. F, Su

4650 Symbolic Processes (4) Logic of signs and symbols; directed and associative thinking; memory, problem solving, and concept formation; nature, use, and development of language. Prereq: 3210 or consent of instructor.

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.

4710 Physiological Psychology (4) Nervous system and physiological correlates of behavior. Prereq: 1 yr of biology or zoology and 2520. W

4719 Physiological Psychology Laboratory (4) Laboratory studies of nervous system and physiological correlates of behavior. Coreq: 4710. W

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Zoology 4720.) F

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Zoology 4729.) F

4750 Evolution and Ontogeny of Social Behavior (4) Genetic, evolutionary, ecological, and developmental processes as they apply to social organization and dynamics of vertebrates. Prereq: Consent of instructor.

4830 History and Systems of Psychology (4) Prereq: req. 9 hrs of upper division psychology.

4850 Learning Theories (4) Historical and theoretical development of learning models. Prereq: 5510 or 5520.

4860 Programmed Learning (3) (Same as Curriculum and Instruction 4860).

4870 Contemporary Research in Behavior (4) Study of interaction of cultural and biological factors in determination of the behavioral of women, with emphasis on physiological mechanisms involved. Sp

4880 Afro-American Psychology (4) Review and analysis of psychological literature on Afro-American. Prereq: consent of instructor. (Same as Black Studies 4880.)

4900 Aspects of Urban Environment (4) Interdisciplinary course in urban problems. Prereq: Consent of instructor. (Same as Architecture 4900, Real Estate 4900.) S/NC only.

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Prereq: 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. S/NC only.

5017 Colloquium in Experimental Psychology (1) Coreq: 5016. S/NC only. F


5050 Methods of Research in Applied Psychology (3) Techniques and principles for designing and conducting psychological research in natural settings.

5070 Seminar in College Teaching (2) Concepts, methods, and materials in introduction of psychology at college level. Emphasis on research. Required of all Ph.D. candidates. S/NC only.

5079 Practicum in College Teaching (2) Supervised participation in college teaching. S/NC only. Sp

5100 Developmental Psychology (3) Prereq: 3550 or Educational Psychology 2430. (Same as Educational Psychology 5100.) F, Sp

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 and self-concept, intimate and isolating implications, and psychosocial and psychosomatic identity and models for decisions. Intended for graduate students in clinical psychology, social work, and community and mental health professions. Prereq: Consent of instructor.

5111-12-13 Seminar in Current Issues in School Psychology (1, 1, 1) Historical, legal, ethical, and technological issues in practice of school psychology. Multiple instructors. (Same as Educational Psychology 5111-12-13.) S/NC only. F, W, Sp

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 Seminar in Industrial and Organizational Psychology (3, 3, 3) (Same as Management 5170-80-90.) F, Sp, W

5200 Topics in Developmental Psychology (3) Prereq: req. 5100 or consent of instructor. May be repeated. Maximum 6 hrs.

*5210 Readings in Psychology (1) S/NC only. E

5230 Readings in Psychology (2) S/NC only. E

5230 Readings in Psychology (3) S/NC only. E

5240 Readings in Psychology (4) S/NC only. E

5250 Readings in Psychology (5) S/NC only. E

5260 Special Problems in Psychology (1) S/NC only. E

5270 Special Problems in Psychology (2) S/NC only. E

5280 Special Problems in Psychology (3) S/NC only. E

5290 Special Problems in Psychology (4) S/NC only. E

5300 Special Problems in Psychology (5) S/NC only. E

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 5319.) S/NC only. F, W, Sp

5320 Behavioral Interventions (3) Principles and techniques for planning, implementing, and evaluating interventions derived from social learning theory. Focuses on interventions by people in community (teachers, supervisors, etc.) in helping cope with daily problems of work, family, the individual, and the community in which they live. Recommended: 1 course in statistics.

5340 Group Dynamics (3) (Same as Educational Psychology 5340.)

5360-70 Seminar in Psychology (3, 3, 3)

5400 Psychophysiology 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; 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 9 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: coreq: 4460.

5510 Instrumentation for Psychological Research (3)

5520 Theory of Measurement (3) Reliability, validity, test construction, scoring, scaling, and test construction tests into batteries. Prereq: 1 qr of graduate-level statistics and 5500 or consent of instructor.

5530 Issues in Applied Psychological Measurement (3) Applications - measurement in community and organizational research. Prereq: Statistics 5500-70 or equivalent and consent of instructor.

5540 Probability Models in Psychology (4) Introduction to use of probability models in theory of binary test items, differential psychology, comparison of different populations in specific psychological parameters, individual choice behavior, and testing of psychological hypotheses in human and animal behavior; reliability theory and regression theory. Prereq: Fundamentals of Psychometrics and one course in statistics.

5550 Advanced Social Psychology (3) Interaction between individual and group, theories of group behavior. Prereq: 3120. May be used for credit in one semester.

5560-70 Seminar in Social Psychology (3, 3) Prereq: 3120. May be used for credit in sociology. May be repeated. Maximum 9 hrs.

5580 Theories of Personality (3)

5581-82-83 Clinical Psychology I: Human Development and Personality (2, 2, 2) First core of doctoral program in clinical psychology. Students take 3-2-hr courses concurrently, each
covering content area from one to three major contemporary points of view.

5589 Psychological Techniques Laboratory (2) Basic techniques of psychological appraisal. Re- 

duction of psychological assessment techniques.

5590 Psychodynamics (3) Research and theory fo-

cussing on origins of behavior.

5591-92-93 Clinical Psychology I: Patterns of Adapt-

tion (2, 2, 2) Second quarter core of doctoral pro-

gam in clinical psychology.

5592 Practicum in Consultation (2, 2) Coreq: 

5600 Doctoral Research and Dissertation (3-15) E

5650 Seminar in Psychometrics (3) Seminar for ad-

advanced graduate students in psychometrics or quantitative psychology, to deal with advanced theories, methodologies, and their applications. Prereq: 4640. S/NC only. Offered in alternate years.

5650 Seminar in Social Psychology (3) Prereq: 3100. May be repeated. Maximum 8 hrs per course.

5670 Forensic Psychology (3) Psychologist's role in legal system; court-appointed, examining, and testimony as expert witness. Offered in alternate years. Prereq: Consent of instructor.

5680 Neural Basis of Behavior (3) Neuroanatomy; basis and symptomatology of neurological syndromes encountered in clinical psychology. Prereq: MA. in psychology or equivalent.

5690 Psychopharmacology (3) Review and evalua-
tion of the roles of medications in psychological assessment and treatment. Prereq: Consent of instructor. Offered in alternate years. Prereq: Consent of instructor. Offered in alternate years. Prereq: Consent of instructor.

5702 Community Psychology (3) Psychological as-
pects 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.

5713 Learning Modules for Techniques in Profes-
sional Psychology (1-4) Set of learning packages; each develops skill in assessment, technology, child ethology, or pathology. Prereq: Consent of instructor. May be repeated. S/NC only.

5750 Ethological Psychology (3) Evolutionary and 

physiological basis of comparative psychology and implications for human behavior. Prereq: Introductory biology and graduate standing.

5760 General Vertebrate Neuroanatomy (3) Lec-
ture-discussion of principles of neuroanatomy, structure and function of central and peripheral nervous system. Prereq: 4710, 4719, or consent of instructor. (Same as Zoology 4760.)

5789 Advanced Techniques in Physiological Psy-

chology (3) Animal and human laboratory proce-
dures central to research in physiological psychol-
y. Prereq: 4710, 4719, and consent of instructor. May be repeated with consent of instructor.

5790 Seminar in Psycholinguistic Concepts in 

Speech Pathology (3) (Same as Speech Pathology 
5791.)

5810 Techniques of Psychological Examination (3) Development and administration of basic examination techniques. Intended primarily for students in fields related to psychology using assessment pro-
cedures. Prereq or coreq: 4640 or equivalent and consent of instructor.

5819 Practicum in Techniques of Psychological EXAMINATION (2) Ordinarily to be taken concurrently with 5850-60-70.

5890 Counseling Theories and Techniques (3) Same as Educational Psychology 5890.

5950-60 Theory and Practice of Consultation (3, 3) Issues in consultation, models of consulting proc-
es, and evaluation of consulting techniques. Must be taken in sequence. Correq: 5599-60 and consent of instructor. (Same as Educational Psychology 5950-60.) W, Sp

5959-69 Practicum in Consultation (2, 2) Coreq: 5950-60. Must be taken in sequence. (Same as Educational Psychology 5959-69.) S/NC only. W, Sp

6000 Doctoral Research and Dissertation (3-15) E

6050 Seminar on Methods of Social Research (3) (Same as Sociology 6050.)

6100 Seminar in Community Psychology (3) Evalua-
tion, research, intervention, and systems for delivering services of communities. Prereq: 5702 and consent of instructor.

6150 Seminar in Program Evaluation (3) Tech-

niques for designing and conducting research to evaluate effectiveness of programs. Prereq: Statistics 5000-60 70 or equivalent and consent of instructor.

6210-20-30 History, Systems, and Theories in Psy-

chology (3, 3, 3) Coreq: M.A. in psychology or equivalent. Maximum 6 hrs each year. Prereq: 5580-90.

6250-60-70 Seminar in Industrial and Organiza-
tional Psychology (3, 3, 3) (Same as Management 6250-60-70.)

6250-60-70 Seminar in Industrial and Organiza-
tional Psychology (3, 3, 3) (Same as Management 6250-60-70.)

6290-90 Factor Analysis (3, 3) Factor analysis; com-

ponent analysis; introduction to latent structure analysis. Prereq: 4640 and 5500.

6300 Seminar in Research Methods (3)

6320 Seminar in Research Methods (3)

6320 Seminar in Research Methods (3)

6330 Seminar in Thinking (3)

6340 Seminar in Developmental Psychology (3)

6350 Seminar in Thinking (3)

6360 Seminar in Sensation and Perception (3)

6370 Seminar in Theoretical Psychology (3)

6380 Seminar in Industrial and Organizational Psychology (3) Prereq: Consent of instructor.

6390 Seminar in Psychotherapy (2) Treatment of current cases, focusing upon psychodynamics, psychotherapy, and therapeutic techniques em-
ployed. Prereq: 5580-90 or equivalent. (Same as Management 5300.)

6395 Seminar in Assessment (3) Seminar for ad-

anced graduate students in clinical psychology, to deal with current research on methods of evaluating the status of individuals seeking clinical aid.

6400 Seminar on Changing Concepts in Clinical Psychology (3) New developments in field in rela-
tion to their impact on experimentation and systems of thought. Prereq: M.A. in psychology or equivalent.

6405 Seminar in Psychopathology (3) Prereq: Con-

sent of instructor.

6410-20-30 Psychotherapy (3, 3, 3) Theories and 

principles of psychotherapy. Prereq: 5580-90. Pre-

req or coreq: 5550-60. W, Sp; F

6411-12-13-14 Psychotherapy; Elective Concentra-
tion Learning Laboratory (2, 2, 2, 2) Typically four psychotherapy concentration areas offered each quarter. Current students in core psychotherapy se-

quence must elect at least one of these in each quarter of sequence. May be repeated. Limited to clinical psychology students enrolled in core psychotherapy sequence or consent of instructor.


6450-60 Advanced Psychometrics (3, 3) Construc-
tion and standardization of psychological tests, questionnaires, and rating scales, theory of errors or measurements; item analysis, scaling, equating, and norms development. Prereq: 4650, 5440, and 5500. May be repeated. Maximum 9 hrs.

6490-2-3-4 Field Placement in Clinical Psychology Levels 1, 2, 3, 4 (1, 1, 1, 1, 1, 1, 1, 1) Supervised clini-
cal experience. Required of and limited to students fully ad-
mitted to Ph.D. program in Clinical Psychol-
ogy. May be repeated. Maximum 8 hrs per course.

6500 Seminar in Psychometrics (3) Seminar for ad-

vanced graduate students in psychometrics or quantitative psychology, to deal with advanced theories, methodologies, and their applications. Prereq: 4640. S/NC only or equivalent. Consent of instructor. May be repeated. Maximum 9 hrs.

6550 Seminar in Advanced Social Psychology (3) Prereq: Consent of instructor. May be repeated. Maximum 8 hrs per course.

6575 Seminar in Mental Health Administration (3) Theory and problems in organization and manage-

ment of mental health administration.

6580-60-70 Systems Approaches in Psychological 

Sociology (3, 3, 3) Emphasis on the development of approaches in schools and other human services settings. Prereq: Consent of instructor. (Same as Educational Psychology 6560-60-70.)

6589-69-79 Practicum in School Psychology III (2, 2, 2) Third year School Psychology Program practicum core sequence. (Same as Educational Psychology 6569-69-79.) S/NC only. W, Sp; F

6710 Seminar in Physiological Psychology (3)

6720 Seminar in Comparative and Ethological 

Psychology (3)

6730 Methods of Ethological and Naturalistic Re-

search (3) Seminar in psychology and field techniques. Prereq: 4720, 5750, 6720, or consent of instructor.

6780 Advanced Psycholinguistics (3) Language from psychological and associated points of view; methodological and theoretical problems. Prereq: Consent of instructor.

6900 Field Work in Industrial and Organizational 

Psychology (1-15) (Same as Management 6900.)

*Note: Psychology 5210-5300, 5350-60-70, 5310-400, 6419-29-39, 6719-20-30, and/or 6900 may be repeated for credit with the approval of the department.

Radiation Biology (interdepartmental)

MAJOR: DEGREES

Radiation Biology M.S., Ph.D.

Daniel Billen, Director

A graduate major in the field of Radiation Biology is offered through the Institute of Radiation Biology. This is a program crossing both departmental and institutional lines. Included on the Institute staff are several scientists from the Departments of Biochemistry, Botany, Chemistry, Microbiology, Physics, Zoology; the Memorial Research Center; the Comparative Animal Research Laboratory of the University of Tennessee; the Biology and Environmental Sciences Divisions of the Oak Ridge National Laboratory; and the Medical Division of Oak Ridge Associated Universities.

Formal courses in this program are offered mainly on the Knoxville campus. Thesis research may be carried out either at the University or at any of the Oak Ridge
Religious Studies

Professors:
F. S. Listby (Head), B. D. Colgate Rochester,
D. L. Dungan, Th.D. Harvard; R. V. Norman, Jr.,

Associate Professors:
W. L. Humphreys, Ph.D. Union; D. E. Linge,
Ph.D. Vanderbilt.
Assistant Professors:
R. R. Earl, Ph.D. Vanderbilt; J. Kim,
Ph.D. Chicago.

Instructor:
J. L. Fitzgerald, M. A. Chicago.

An M.A. in Philosophy with a concentration in religious studies is available for graduate work in these related fields. (Details of this program are available in the office of either department.) Graduate courses in religious studies further provide opportunity for pursuit in a variety of disciplines to pursue work in religious studies as a graduate concentration.

3060-70-80 History of Western Religious Thought and Institutions (3, 3, 3) 3060—First Century to Fifth Century. 3070—Sixth Century to Fifteenth Century. 3080—Sixteenth Century to 1900. (Same as History 3060-70-80.)

3210 Early Greek Mythology (3) (Same as Classics 3210.) F

3220 Early Greek Mythology in the Classical Period (3) (Same as Classics 3220.) W

3230 Roman Mythology (3) (Same as Classics 3320.) Sp

3270 Russian Philosophical and Theological Thought (4) (Same as Philosophy 3270 and Russian 3270.)

3411-12-13 Renaissance and Reformation (3, 3, 3) (Same as History 3411-12-13.)

3440 Religion of Primitive Peoples (3) (Same as Anthropology 3440.)

3650 Philosophy and Religion in India (4) (Same as Philosophy 3650.) F

3660 Buddhist Philosophy and Religion (4) (Same as Philosophy 3660.) W

3671 Religion and Philosophy in China (4) (Same as Philosophy 3671.)

3690 Philosophy of Religion (4) (Same as Philosophy 3690.)

4111-21 Modern Religious Philosophies (4, 4) Examination of the religious implications of major thinkers and movements. 4111—Nicolas of Cusa to Hume, 4121—Kant and the nineteenth century. Prereq: 9 hrs of philosophy other than logic. (Same as Philosophy 4111-21.)

4210 Topics in Ancient Israelite and Ancient Near Eastern Religions (4) Prereq: 3110 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 Palestinian Judaism; analysis of what the Apostle Paul made of the tradition of and about Jesus. Recommended prereq: 2810 or 2811.

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 Topics in Early Christianity and Hellenistic Religions (4) Selected figures, issues, and institutions. Senior and graduate students only, except by consent of department. Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4470 Topics in Eastern Religions (4) Selected figures, issues, and institutions. Senior and graduate students only, except by consent of department. Prereq: 3560-60-71-72. May be repeated. Maximum 12 hrs.

4510-20-30 Readings and Research in Religious Studies (3-4, 3-4, 3-4)

4540 Readings in Selected Languages Related to Religious Studies (3-4) Prereq: Consent of instructor. May be repeated. Maximum 12 hrs.

4590 Sociology of Religion (4) (Same as Sociology 4590.)


4600 Tradition, Change and Modernity in Asia (4) Comparative study of processes of religious and social change seen 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. (Same as Sociology 4600.)

5101 Foreign Study (1-12) See page 95.

5102 Off-campus Study (1-12) See page 95.

5103 Independent Study (1-12) See page 95.

5310-20 Topics in Religion and Society (4, 4)

5355 Orientation to Medical Ethics (4) (Same as Philosophy 5355.)

5365 Applied Ethical Theory (4) (Same as philosophy 5365.)

5510-20 Topics in the History of Religion (4, 4)

5710-20 Topics in Religious Thought (4, 4)

Romance Languages

MAJORS

DEGREES

M.A., Ph.D.

Professors:
H. C. Rutledge (Head), Ph.D. Ohio State;
W. R. Averett (Emeritus), Ph.D. Texas;
E. A. Barrette, Ph.D. Southern Illinois; C. W. Cobb,
Ph.D. Tulane; P. J. Cooper, Ph.D. Tulane; T. B. Drake,
Ph.D. Princeton; E. H. Lewald, Ph.D. Minnesota;
J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess (Emeritus), Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
Ph.D. Duke; W. F. Byess, Ph.D. Tulane; P. J. Cooper,
Ph.D. Tulane; T. B. Drake, Ph.D. Princeton;
E. H. Lewald, Ph.D. Minnesota; J. Kim, Ph.D. Southern Illinois;
R. M. DeRycke, Ph.D. Illinois; J. C. Elliott,
Ph.D. Tulane; W. F. Byess, Ph.D. Wisconsin;
D. L. Dungan, Th.D. Harvard; R. P. Norman,
hours in supervised instructional experience. French or Spanish must be selected as the major subject, and at least 36 hours of graduate course work, including 9 hours of thesis and 9 hours of linguistics and philology, and 3 hours of problems in language teaching, must be completed. In addition, civilization courses are strongly recommended. Spanish or French must be selected as the minor subject, in which at least 18 hours of graduate work must be completed.

THE MASTER OF ARTS PROGRAM

The student may select either Plan A or B: Plan A

1. Completion of a minimum of 36 quarter hours of which 24 must be taken in courses numbered above 5000, including 5011 (French or Spanish, as appropriate).


3. A written examination covering the course work and selected items from a master reading list.

4. A final oral examination covering the thesis.

Plan B

1. Completion of 45 quarter credits of which 33 must be in courses beyond 5000, including 5011 (French or Spanish, as appropriate).

2. Three term papers that have been accepted as satisfactory by the Advisory Committee.

3. A written examination covering the course work and selected items from a master reading list.

THE DOCTORAL PROGRAM

Residence and Course Work:

Completion of at least three consecutive quarters of full-time residence, a minimum of 81 credit hours in course work beyond the Bachelor's degree or its equivalent, and a dissertation (96 credit hours).

No less than 54 quarter hours should be taken in courses pertaining to the student's major field; of these a minimum of 18 hours are to be taken in courses above 6000, a maximum of 12 hours may be taken in courses of the 4000 level and the rest in courses above 5000. All students must complete the series in methods of research (5151-61-71) for a total of 3 credits. The minor student must complete a minimum of 12 hours of which at least 12 hours must 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 proficiency 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. Examinations:

A preliminary 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 preliminary examination is to be held at the time deemed most appropriate by the student's major advisor and committee. The candidate is expected to defend the dissertation in a final oral examination.

For additional information on the program, consult pages 8-9.

Arabic

3510-20 Intermediate Modern Standard (4, 4) A

3610 Islamic Literature in English Translation (4) A Survey from origins to modern period of major Islamic literatures, especially Arabic, Persian, and Turkish. Readings include The Arabian Nights, The Rubaiyat of Omar Khayyam and Gibran's The Prophet. A

5070-80-90 Hispano-Arabic Literature and Culture (3, 3, 3) (Same as Spanish 5070-80-90) A

5101 Foreign Study (1-12) See page 95. E

5102 Off-campus Study (1-12) See page 95. E

5103 Independent Study (1-12) See page 95. E

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. A

4010 Masterpieces of French Literature in English Translation (3) No foreign language credit. A

4200 Masterpieces of French Drama in English Translation (3) No foreign language credit. A

4210-20-30 French Literature of the Seventeenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4150 Théatrical 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: 2190, 2520, or equivalent. F

4220-30 Advanced Grammar (3, 3) Prereq: 2190, 2520, or equivalent. W, Sp

4250 Introduction to Descriptive Linguistics (3) Phonetics and phonology, morphology and syntax. Types of languages, linguistic groups, dialects and dialect geography. Application of descriptive linguistics-field linguistics, dialect study; its practical use in learning languages and in language teaching. Introduction to transformational grammar. Prereq: 9 hrs of upper division English or 9 hrs of upper division courses in a modern or ancient language (exclusive of German and French 3010-20-30, 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, Spanish and Russian 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) (Same as German, Russian, and Spanish 4260.) W

4270 Romance Linguistics (3) Development of Classical Latin through Vulgar Latin into major Romance languages. (Same as Spanish 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

4650-50-60 French Literature of the Sixteenth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

4710-20-30 French Literature of the Twentieth Century (3, 3, 3) Prereq: Intermediate French or equivalent. A

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/N Only. E

5011 Techniques in Literary Analysis (3) Required for either Plan A or Plan B of M.A. program. Intensive course in explication de texte. F

5101 Foreign Study (1-12) See page 95. E

5102 Off-campus Study (1-12) See page 95. E

5103 Independent Study (1-12) See page 95. E

5110-20-30 Old French (3, 3, 3) Medieval French language and literature. A

5121 College Teaching of Romance Languages (3) Seminar in 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/N Only. E

5210-20-30 French Literature of the Sixteenth Century (3, 3, 3) A

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) A

5460 German and English influences on French Romanticism and generation of the poets of "le mal du siecle." 5460—Victor Hugo, the Parnassians. A

5470 Baudelaire and the Symbolists (3) Les Fleurs du mal et petits poèmes en prose with emphasis on theories of color and "correspondances" and their influence on Symbolist school. A

5510-20-30 The French Drama (3, 3, 3) From Seventeenth Century to present. Emphasis on Seventeenth Century. A

5610-20-30 Trends in Contemporary French Literature (3, 3, 3) A

5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in form of compositions, sketches, and original stories. A

5670 Problems in Romance Linguistics (3) Topics vary. May be repeated with consent of department. Prereq: 4270 or equivalent. (Same as Spanish 5670.) A

5710-20-30 Seminar in French Literature (3, 3, 3) Topics vary. May be repeated with consent of department. Su

5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as Spanish 5910.) A

Italian

3210-20-30 Civilization and Culture (3, 3, 3) Prereq: Intermediate Italian or equivalent. A

3310-20-30 Italian Literature in English Translation (3, 3, 3) 3310-Sicilian School, the Florentine School. Dante, Petrarch (V. Boccaccio, M. Muscaviel, Ariosto, Tasso. 3320-From the Baroque through nineteenth century, commedia dell'arte, Vico,
The picaresque novel; Cervantes; the consent of instructor. Directed Readings in Brazilian and Portuguese Literature (4310-20-30) and Spanish Literature of the Golden Age (4210-20-30) are listed.

4050-60-70 Dante and Medieval Culture (3, 3, 3) Readings and lectures in English for students majoring or minoring in Italian. (Same as Comparative Literature 4560-60-70.)

4220 Petrarach (3) Prereq: 3130, 3520 or equivalent.

4230 Boccaccio (3) Prereq: 3130, 3520 or equivalent.

4330 History of Italian Language (3) Prereq: 3130, 3520 or equivalent.

4410-20-30 Literature of the Rinascimento (3, 3, 3) From Pulci to Tasso, the Quattrocento and the Cinquecento. Prereq: 3130, 3520 or equivalent.

4530 The Modern Novel (3) Prereq: Intermediate Italian or equivalent.

4540 The Modern Theatre (3) Prereq: Intermediate Italian or equivalent.

4610 Contemporary Theatre (3) Prereq: Intermediate Italian or equivalent.

4620 Contemporary Poetry (3) Prereq: Intermediate Italian or equivalent.

4630 Contemporary Prose (3) Prereq: Intermediate Italian or equivalent.

5011 Techniques in Literary Analysis (2) Intensive course in explanation of text.

5001 Foreign Study (1-12) See page 95. E

5012 Off-campus Study (1-12) See page 95. E

5103 Independent Study (1-12) See page 95. E

5151-61-71 Bibliography and Methods of Research (1, 1, 1) (Same as French and Spanish 5151-61-71.) S/NC only. A

5610-20-30 Readings in Italian Literature (3, 3, 3) Topics vary and may be repeated with consent of department.

5710-20-30 Seminar in Italian Literature (3, 3, 3) Topics vary and may be repeated with consent of department.

Portuguese

3510-20 Aspects of Portuguese Literature (4, 4) Prereq: Intermediate Portuguese or equivalent. Recommended for literature majors. F; W

4310-20-30 Directed Readings in Brazilian and Portuguese Literature (3, 3, 3) May be repeated with consent of instructor. F; W; Sp

5101 Foreign Study (1-12) See page 95. E

5102 Off-campus Study (1-12) See page 95. E

5103 Independent Study (1-12) See page 95. E

Spanish

4030 Masterpieces of Spanish Literature in English Translation (3) No foreign language credit.

4050-60-70 Hispano-Arabic Literature and Culture (3, 3, 3) A

1110-20-30 Spanish Literature of the Golden Age (3, 3, 3) The picaresque novel; Cervantes; the Commedia. A

1160-70-80 Advanced Conversation (2, 2, 2) Intensive training in prepared and spontaneous conversational exchanges. 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

4240-30 Advanced Grammar (3, 3) Prereq: 2130, 2520, or equivalent. F; W; Sp

4250 Introduction to Descriptive Linguistics (3) (Same as French, German, and Russian 4250.) F

4260 Introduction to Historical and Comparative Linguistics (3) (Same as German, Russian, and French 4260.) W

4270 Romance Linguistics (3) (Same as French 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

4450-70 Studies in Modern Spanish Style (3) Prereq: 3420-20-30 or consent of Instructor. A

4510-20-30 Spanish Literature of Nineteenth Century (3, 3, 3) Prereq: Intermediate Spanish or equivalent.

4720-30 Spanish Literature of the Twentieth Century (3, 3, 3) 4710—Non-dramatic prose fiction. 4720—Drama. 4730—Lyric poetry. Prereq: Intermediate Spanish or equivalent. A

4820-30 Topical Survey of Spanish American Literature (3, 3, 3, 3) Prereq: Intermediate Spanish or equivalent.

5050 Thesis (1-3) E

5062 Non-Thesis Graduation Completion (3-15) Required for the non-thesis study and not otherwise registered during any quarter when a student uses university facilities and/or faculty time before degree is completed. 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. An intensive course in explication de texte. F

5070-80-90 Hispano-Arabic Literature and Culture (3, 3, 3) 5070—General culture history, philosophy in Arab Spain. 5080—Development of traditional market-place story, or episodic prose narrative, into modern novel of character after invention of printing. 5090—Mutual influence of traditional Arabic poetry and popular and native Spanish choral lyric; development of classical muwashshah, the colloquial zajal, and the later villancico. Readings in Arabic and Spanish. (Same as Arabic 5070-60-90.) A

5101 Foreign Study (1-12) See page 95. E

5102 Off-campus Study (1-12) See page 95. E

5103 Independent Study (1-12) See page 95. 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 the bearing of course by department. F

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. A

5222-32 Golden Age Prose (3, 3) 5212—La Celestina; critical study of Fernando de Rojas’s life and work; Celestinesque genre; Pellicerio de Silva’s Segunda Celestina, 5222—Spanish philosophical thought; mystical prose; satirical works. 5223—Guadamur de Alfarrache and Spanish picaresque genre. A

5233The Exemplary Novels, Perales y Sigsmaiunda (3) A

5250-60 The Generation of 98 (3, 3) Angel Gaxinet, Galdos, Los Rios, Barroa, Unamuno, Valle Inclan, Benavente, Azorin, Perez de Ayala. A

5270 The Contemporary Novel (3) Civil War and post-Civil War period.

5310-20 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

5510-29-30 The Spanish Theatre after the Golden Age (3, 3, 3) 5510—From eighteenth century through Romanticism. 5520—From realism through Generation of 1898. 5530—Contemporary Theatre. A

5550-60-70 The Golden Age Theatre (3, 3, 3) 5550—Introduction to Spanish theatre, Lope and Tirso, 5560—Castro, Mira de Amescua and Afacon. 5570—Rojas Zorrilla, Moreto, and Calderon. A

5610 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 Dario, Quiroga, Borges, Arreola, and Rulfo. A

5633 Twentieth-century Latin American Theatre and Film (3) Readings from works of Carlos, Solorzano, Rodolfo Usigli, Conrado Nae Rexlo, Roberto Cossa, Rene Marques and Sebastian Salazar Bondy. Presentation of films as adaptations of classics such as Doha Barbara, 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, Male-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, Silvina Bullrich, Silvina Ocampo and Rosario Castellanos. A

5650-60 Advanced Syntax and Stylistics (3, 3) Readings and written imitations of modern literary styles in compositions, sketches, and original stories. A

5670 Problems in Romance Linguistics (3) (Same as French 5670.) A

5810-20-30 Spanish Lyric Poetry (3, 3, 3) A

5910 Literary Criticism: The Foundations of Romance Criticism (3) (Same as French 5910) A

6000 Doctoral Research and Dissertation (3-15) E

6210-20-30 Seminar in Spanish Literature (3, 3, 3) Topics vary in field of Peninsular Literature. May be repeated with consent of department. A

6310-20-30 Seminar in Latin American Literature (3, 3, 3) Topics vary. May be repeated with consent of department. A

Russian

See German

Sociology

MAJOR degrees sociology

M.A., MACT, Ph.D.

Professors: D. R. Ploch (Head), Ph.D. North Carolina; J. A. Black, Ph.D. Iowa; J. A. Black, Ph.D. Wisconsin; L. E. Eeles, Ph.D. Pennsylvania; S. Wallace, Ph.D. Minnesota.
THE MASTER'S PROGRAM


page 19.

Those interested in the non-thesis with thesis, see the General Requirements on requirements, students are referred to the doctoral requirements of Doctoral Research and Dissertation.

1. A minimum of 108 credit hours following the Bachelor's degree, exclusive of credits for the Master's thesis, is required. 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 preliminary 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 the degree, the candidate will be required to pass an oral examination on the doctoral dissertation. 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 origins and consequences of law and legal process. Particular emphasis is placed on problems of law and social change, and on structure and functioning of legal systems. 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.

4130 Criminology (4)

4330 Urban Ecology (4) Examination of public, private, collective, and individual space. Classical and modern ecological, its neo-classical revisers, social area analysis, and cognitive symbolic ecology emphasized.

4410 Educational Sociology (3) (Same as Curriculum and Instruction 4410.)

4530 Community Organization (4) Structure, function, network; linkage, change and development and important community studies are reviewed and discussed. Emphasis on sociological analysis, not on the implementation of policies.

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.

4550 Formal Organization (4) Analysis of bureaucratization process, division of labor, delegation of authority, and controlled communication under a system of rationality.

4820 American Minority Groups (4) Minority groups and social structure in American society; 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 4940.)

4960 Tradition, Change and Modernity in Asia (4) (Same as Religious Studies 4960).

5000 Thesis (1-15) E

5020 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 Professional Seminar (1) Limited to sociology graduate teaching assistants or graduate assistants. May be repeated. Maximum 4 hrs. S/NC only. W, Sp

5040 Methodological issues in Social Research (3)

5050 Seminar in Political Sociology (3) Political system from societally, organizational, and group perspectives.

5060-70 Special Social Investigation (3), (Directed readings and/or research projects. E

5200 Seminar in Collective Behavior and Social Movements (3)

5210 Social Theory (3) F

5220 Social Control (3)

5230 Seminar in Sociology of Medicine (3)

5251 Historical Demography (3) Family reconstitution, aggregate analysis, analysis of methods for dealing with data, research findings related to them, and their implications for formal strategies of control and rehabilitation.

5260 Seminar in Race and Culture (3) Critical analysis of contemporary theoretical orientations to study of small groups. Research designed to test selected theoretical problems. May be repeated.

5230 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.

5810 Seminar in Race and Culture (3) Critical examination of theoretical and conceptual approaches in study of intergroup relations. A

5910 Urban and Regional Sociology (3)

5920 Seminar in Social Attitudes (3)

5940 Delinquency and the Social Structure (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.

5970 The Sociology of Development and Modernization (3) Comparative approach to institutional and organizational correlates of modernization. Emphasis is placed on various parts of world; fertility rates and national dependence of theory and therapeutic techniques.

5980 Seminar in Population Problems (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, Sp

5990 Seminar in Community Power (3) Analysis of theories and methods used in studying social power in communities.

5320-30 Social Statistics (3, 3) General survey of social statistics, their relation to conflict in society, and their relationship to social class structure in society.

5610 Seminar in Occupations (3) Occupations and their relation to individual and society, technology, and organizations. Use of rewards and occupations; social organization and occupations.

5620 Seminar in Occupations (3) Continuation from material in Sociology 5610; interface between occupations and society in which they are performed.

5630 Seminar in Occupations (3) Research participated; directed projects on subjects developed in Sociology 5620. Prereq. 5610 or 5620.

5640 Social Structure and Personality (3) Social interaction and personality; genesis and functioning of self; cultural basis of personality. May be used for credit in psychology.

5670 Social Organization (3) Structure and function of human groups, with special attention to voluntary associations and administrative organizations.

5720 Small Group Theory and Research (3) Critical examination of contemporary theoretical orientations to study of small groups. Research designed to test selected theoretical problems. May be repeated.

5730 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.

5810 Seminar in Race and Culture (3) Critical examination of theoretical and conceptual approaches in study of intergroup relations.

5910 Urban and Regional Sociology (3)

6000 Doctoral Research and Dissertation (3-15) E

6040 Experimental Research (3)

6050 Seminar on Methods of Social Research (3) Experimental research projects. (Same as Psychology 6050.)

6070 Field Research (3)


6090-100 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).

6130 Seminar in Mass Behavior and Related Topics (3)

6140 Advanced Readings in Sociological Theory (4) S/NC only. E

6150 Advanced Readings in Sociological Methods (4) S/NC only. E

6160 Special Social Investigation (4) E

6170 Cross-cultural Aspects of 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 development of theoretical conceptualizations. Interdependence of theory and therapeutic techniques. Epidemiology of mental disorders. Review of major studies.

5590 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to contending social classes and their relationship to class structure in society.

5580 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to contending social classes and their relationship to class structure in society.

5590 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to contending social classes and their relationship to class structure in society.

5580 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to contending social classes and their relationship to class structure in society.

5590 Social Differentiation and Stratification (3) Various sources of differentiation in society, their relation to contending social classes and their relationship to class structure in society.
power; controversies on control of vital rates of growth.

5180 Theory and Method of Human Ecology (3) Theoretical perspective and research techniques of human ecology applied to selected research sites.

5190 Advanced Special Social Investigation (4) E

6240 Theory and Research in Human Migration (3)

6510 Advanced Issues in Criminological Theory (3) Emphasis on problems related to theory construction and measurement.

6520 Sociology of Deviance (3) Advanced studies in deviant behavior. Theories and findings regarding cause 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 the theoretical and methodological issues encountered in studying law. A

6540 Readings in Criminology and Deviance (3) Directed readings and selected topics on criminology and deviance.

6550 Advanced Studies in Community (3) Analysis of concepts of community; theories of community change, and techniques used in community research.

6610 Seminar in 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: 3610-20.

6620 Seminar in Formal Organization (3) Organizations, organizational change and effect of technology; social consequences of automation; unionization and organization; organizations and community interrelatedness. Prereq: Consent of instructor.

6630 Seminar in Formal Organization (3) Comparative organizational analysis; case studies, selected readings; personality and organization. Prereq: Consent of instructor.

6710 Seminar in Class and Status (3) Classic and recent studies of class and status. Methods used in research and current position of theory.

6810 Advanced Studies in Social Psychology (3) Social interaction and personality, genesis and functioning of self; interplay of social structures and individual actions; theories of social psychology related to these problems and research trends. May be repeated. Prereq: 3130 or 5640 or Psychology 5550.

6840-50 Social Change (3, 3) Major theories, methods, and research.

6940 Advanced Studies in Urban Sociology (3) Field work projects and community studies examined and/or applied in specified areas. Prereq: 3410-20.

6950 Seminar in Population Theory (3) Malthus, Marx, optimum population, and selected variables. A

Spanish

See Romance Languages

Speech and Hearing

See Audiology and Speech Pathology

Speech and Theatre

MAJOR

Speech and Theatre

DEGREE

M.A.

Professors:

R. G. Allen, D.F.A. Yale; T. P. Cooke, Ph.D.
Florida State; R. M. Coffran; J. F. Fields
(Emeritus), M.A. Ohio State; H. W. Henshaw, Ph.D.

Pittsburgh; P. L. Soper, (Emeritus) Ph.D.
Cornell; G. A. Yoemans, Ph.D. Louisiana State.

Associate Professors:

N. C. Cook, M.A. Alabama; R. C. Field, M.A.
Miami (Ohio); D. F. Glenn, Ph.D. Northwestern;
A. J. Harris, Ed.D. Tennessee; F. D. Julian, Ph.D.
Tennessee; L. W. Lester (Head), Ed.D. Tennessee; R. R. Maburn, M.A.

Assistant Professors:

R. S. Ambler, Ph.D. Ohio State; M. L. Ambrester,
Ph.D. Ohio (Athens); J. F. Buckley,
Ph.D. Northwestern; M. Custer, M.F.A.
Wilson; B. V. Daniels, Ph.D. Cornell,
L. J. DeCuir, M.F.A. Tulane.

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 22 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 theatre.

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.

For detailed information, contact the Director of Graduate Studies, Department of Speech and Theatre.

Speech

3541 Rhetorical Theory and Criticism (4) Survey of Western rhetorical theory; contemporary approaches in criticism of public address. Recommended: 1211.

4222 Advanced Argumentation and Debate (4) Prereq: 2331 or consent of instructor.

4461 Quantitative Research Methods In Speech Communication (4) Designing experiments; planning field studies; using statistical analysis.

451 Southern Oratory (4) Historical and critical study of public address in the South.

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. F

4571 British Oratory (4) Historical and critical study of British public address. Sp, A

4582 Public Discussion of Race (4) History and criticism of racial advocacy in America.

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 American English language. Prereq: Consent of instructor. Sp, A

4911-21 History of American Public Address (4, 4) 1865—1866 to present. W, A; Sp, A

4999 Colloquium in Speech Communication (1) May be repeated. E

5140 Communications Theory (3) Analysis of contemporary theories of communication, emphasizing similarities and differences of communication processes in interpersonal, intrapersonal, and mass communications systems.

5210 Topics in Group and Interpersonal Communication (3) May be repeated. Maximum 9 hrs. Sp

5220 Quantitative Projects in Speech Communications (3) May be repeated. Maximum 9 hrs. E

5430 Studies in Tennessee Oratory (3) May be repeated. Maximum 9 hrs.

5440 Organizational Communication (3) May be repeated. Maximum 9 hrs. F

5550-60-70 Studies in Persuasion (3, 3, 3) W

5750-60-70 Studies in Rhetoric (3, 3, 3) F

5911 Directing the Forensic Program (4) Philosophy and methods of directing cocurricular and extracurricular 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

4170-80-90 Film History and Theory (3, 3, 3) Analysis of cinematic forms and styles. 4170—Narration. 4180—Exposition and persuasion. 4190—Experimental forms; films and other media.

4640 Group Performances of Literature (4) Oral interpretative techniques of choral reading, readers theatre and chamber theatre. F, W

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. SNC only. 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

5160 Theory and Technique in Oral Interpretation (4) Literary, psychological, communicative, and aesthetic approaches to collection, adaptation, and oral presentation of literature. May be repeated. Maximum 8 hrs. W, Sp

Theatre

3121-22 Advanced Acting (4, 4) Historical styles of acting. 3121—Renaissance; 3122—seventeenth and eighteenth centuries. Prereq: Consent of instructor.

3151 Theatre Practicum: Performance (1-4) Supervised work on departmental productions. Available for credit only to theatre majors or with consent of department. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. E

3152 Theatre Practicum: Production (1-4) Supervised work on departmental productions. Available for credit only to theatre majors or with consent of department. Prereq: Consent of instructor. May be repeated. Maximum 4 hrs. E

3153 Summer Repertory Productions (4) Supervised work on summer repertory productions. Available only to members of summer company by consent of instructor. Su

3214-15 Technical Theatre (4, 4) Special techniques in scenery and property construction; stage management; lighting; basic and call theatre practice. Prereq: 2211-21, or consent of instructor. Must be taken in sequence.

3221-22 Introduction to Scene Design (4, 4) 3221—Problems in stage design with reference to space and form, movement, scale, and style; rudiments of rendering and groundplan preparation. 3222—Play
3550 Projects in Costume Design (3) Problems of play interpretation and theatrical costume design centralizing upon individual projects. Students will design costumes for complex plays for public performance. May be repeated. Maximum 9 hrs. E

5600 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) Sp

5680-81-82 Design and Technical Theatre Seminar (6, 6, 6)

5800 Studies in Theatrical Production (3) May be repeated. Maximum 9 hrs. Sp

5912 Play Production in Secondary Schools (4) Principles and methods for directing high school dramatic programs. (Same as Curriculum and Instruction 5912.) Su

5950-60-70 Studies in Dramatic Theory and Criticism (3, 3, 3) F, W, Sp

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 utilization. Topical focus will change from quarter to quarter. May be repeated with consent of instructor. May not be taken for graduate credit by Ecology majors.

ZOOLOGY

MAJOR

Zoology DEGREES M.S., Ph.D.

Professors:
J. H. Abel (Head), Ph.D. Brown; R. M. Bagby, Ph.D. Ohio State; L. E. Roth, Ph.D. Chicago; D. A. Etnier, Ph.D. Minnesota; R. C. Fraser, Ph.D. Michigan; W. H. Schuchman, Ph.D. California (Berkeley); J. C. Howell, (Emeritus), Ph.D. Cornell; K. W. Jeon, Ph.D. London (England); A. W. Jones, (Emeritus), Ph.D. Virginia; J. R. Kennedy, Ph.D. Iowa; J. N. Liles, Ph.D. Ohio State; L. E. Roth, Ph.D. Chicago; C. A. Shivers, 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. Burnham, Ph.D. Iowa; A. C. Eckernacht, Ph.D. Kansas; A. A. El-Bawar, Ph.D. Washington State; D. L. Bunting, Ph.D. Ohio; J. F. Johns Hopkins; A. M. Jungreis, Ph.D. Minnesota; J. A. MacCabe, Ph.D. California (Davis); M. L. Pan, Ph.D. Pennsylvania; S. E. Riechert, Ph.D. Wisconsin; G. A. Vaughan, Ph.D. Duke; M. C. Whitehead, Ph.D. Indiana.

Assistant Professors:
T. T. Chen, Ph.D. Florida; L. D. Etkin, Ph.D. Indiana; N. Greenberg, Ph.D. Rutgers; M. A. Handel, Ph.D. Kansas State; G. F. McCracken, Ph.D. Cornell.

The Department of Zoology offers the Master of Science and Doctor of Philosophy degrees with concentrations in aquatic biology and ecology, cell biology and radiation biology, physiology, genetics, organismal and field biology, and reproduction and developmental biology.

Requirements for admission: Applicants for graduate study are expected to have a background no less extensive than that required of undergraduate majors in this department. This includes a knowledge of the basic principles of cell biology, genetics, and ecology. Other requirements for admission are: (1) general zoology or general biology, 12 quarter or 8 semester hours; (2) upper division zoology, 18 quarter or 12 semester hours; (3) chemistry, two years including 12 quarter or 8 semester hours of general inorganic; (4) mathematics, 9 quarter or 6 semester hours including differential and integral calculus; (5) physics, 12 quarter or 8 semester hours; (6) Graduate Record Examination (General or Graduate Record Examination in Biology and Advanced Biology); and (7) a grade point average of 3.0 out of a possible 4.0. Otherwise superior students, deficient in one or more of the above requirements, may be admitted at the discretion of the Graduate Affairs Committee.

A course in biostatistics is required of all candidates for an advanced degree in Zoology.

All aspirants for advanced degrees in Zoology must exhibit competency in four (M.S.) or five (Ph.D.) of six areas of zoology as determined by a comprehensive examination. Students must take this examination during the fall quarter of the first year and may repeat the examination the following fall quarter if unsatisfactory scores are received.

Competency must be exhibited within this two-year period for a student to continue in the program.

Preparation for thesis or dissertation: During the first year a written examination and a special research problem in each of two faculty members' laboratories will determine the student's preparation for thesis or dissertation study.

THE DOCTORAL PROGRAM

Special requirements in Zoology are as follows: (1) course requirements shall be determined by the candidate's faculty committee; (2) the preliminary examination will be oral and written examination in zoology and in allied fields in which the candidate has had training; (3) the candidate for the Ph.D. degree must possess a reading knowledge of at least one foreign language in which there exists a sizeable amount of literature relevant to the major field of study. The student has the option of demonstrating a reading knowledge of this foreign language by (a) passing the official reading examination given by the language department or (b) earning at least a B in 3030 language courses. This requirement for the first language must be fulfilled before the student can take the preliminary 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.

*Alumni Distinguished Service Professor
4269 Comparative Animal Physiology Laboratory II (1) Coreq: 3080 and consent of instructor. Coreq: 4260.

4270 Immunology (3) (Same as Microbiology 4270.)

4280 Comparative Endocrinology (5) Comparative analysis of the physiology and morphology of endocrine glands in vertebrates and invertebrates. Their role in regulation of metabolism and maintenance of homeostasis of the organism and species. Prereq: 3060 or 3920. 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 of birds and 2 labs or field periods. Sp

4310 Nuclear Cytology (4) Chromosome structure and behavior in mitosis and meiosis. Prereq: Biology 3110. 1 hr and 3 labs.

4320 Microtechnique (4) Prereq: 3320 recommended. 2 hrs and 2 labs.

4330 General Cytology (4) Study of cellular organisms at the light and electron microscope levels and the functioning of these organelles. Prereq: Biology 3120. Sp

4369 General Genetic Laboratory (2) Methods for the study of genetic phenomena involving cells and organisms. Prereq: 1 yr biological science, general physics; recommended prereq: Biochemistry 4120 or Biology 3130.

4410 General Parasitology (4) Morphology, taxonomy and ecology of parasitic worms and protozoa, with emphasis on host-parasite relationships. 3 hrs and 1 lab. Prereq: Biology 3130 or consent of instructor. F

4430 Medical Entomology (4) Distinctive morphological features, distribution, life histories, and control of arthropods that parasitize human or serve as vectors of human pathogens. Recommended prereq: Agricultural Biology 3210 or Biology 3130. F

4450 Protozoology (4) Morphology, taxonomy, and physiology of protozoa in relation to fundamental biological concepts. 2 hrs and 2 labs. Recommended prereq: Biology 3120.

4610-20 Comparative Animal Pathology (2, 2) Abnormal morphological changes and their causes. 4610—Cell and tissue changes. 4620—Organ, organ system, and organism changes. Recommended: 3060, 3080, 3320.

4619-20 Comparative Animal Pathology Laboratory (2, 2) Methods and principles. Correlates with 4619-20. Coreq: 4619-20. F

4660-70 Limnology (4, 4) 4660—Effects of origin, age, and location of lakes on their physical and chemical nature. 4670—Lake communities, productivity and pollution. Prereq: Chemistry 1110-20 and Biology 3120. Recommended: Botany 1110-20 and Physics 1210-20-30. 2 hrs 2 labs (4660); 3 hrs and 1 lab (4670). Must be taken in sequence, except with consent of instructor. F, Sp

4700 Arachnology (4) Biology of spiders, mites, scorpions, and relatives. Prereq: 3110, or 3150. 2 hrs and 2 labs.

4720 Comparative Animal Behavior (4) Methods and principles. (Same as Psychology 4720.) F

4729 Comparative Animal Behavior Laboratory (4) Laboratory and field studies. Coreq: 4720. (Same as Psychology 4729.)

4810-20 Insect Morphology and Taxonomy (4, 4) 4810—Dutch students may participate in both generalized and specialized forms. 4820—Taxonomy of major orders. 4830—Taxonomy of minor orders and immate forms. Prereq: 4820-30; 3110 or consent of instructor. 2 hrs and 2 labs. Sp; A

4940 Physiology of Exercise (4) Functions of body in muscular work; physiological aspects of fatigue, training, and athletic fitness. Prereq: 2920-30 or 3060. 3 hrs and 1 lab. F, Sp

5000 Thesis (1-15) E

5080 Graduate Research Participation (3) Advanced research techniques studied under supervision of staff research members. Technique coincides with interests of student. Open to all graduate students in good standing. Prereq: Consent of Department. Technically may be repeated with consent of department. S/N only. E

5110-20 Special Problems (2, 2, E)

5150 Zoological Bibliography (1) Methods of locating and using zoological literature, bibliographies, and abstracts in preparation of 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.

5210 Plant Parasitic Hematodes (4) (Same as Agricultural Biology 5210.)

5260 Physiology of Hormones (4) Cellular and organ systems, and actions of hormones in invertebrate and vertebrate animals. Prereq: 4260. Recommended prereq: Biochemistry 4120. 2 hrs and 2 labs.

5270 Advanced Neumorruscular Physiology (5) Cellular and molecular aspects of phenomena associated with conduction of excitation and muscular contraction. Recommended kinders of laboratories. F

5290 Quaternary Problems (4) (Same as Geology 5290 and Botany 5290)

5310-20 Seminar in the Teaching of College Zoology (2, 2) Current concepts and principles in teaching of zoology; modern techniques and instrumentation; supervised application of teaching principles and methods. Must be taken in sequence. Prereq: Consent of instructor. S/N only.

5350 Biometry (3) Statistical methods used in analysis of quantitative biological data. Prereq: 1 yr statistics or consent of instructor.

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 Advanced Animal Physiology (5, 5) Primarily mammalian physiology: 5515—membrane neuron, central nervous system, muscle, cardiovascular system, and autonomic nervous system; 5516—illustrates the 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. W or consent of instructor. Biochemistry 4120 also recommended. (Same as Animal Science 5510-20.) 4 hrs and 1 lab. F, Sp

5550 Advanced Ornithology (4) Classification, distribution, and anatomy of birds. Prereq: 4340.

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 ionizing radiation on living cell and its components. Recommended prereq: 1 yr biological science, general physics; recommended prereq: Radiation Biology 5610-20) 3 hrs and 1 lab.

5630 Methods of Experimentation with Laboratory Mammals (3) Designed to give competence in handling research mammals. Techniques of anesthesia, drug administration, radiography and surgery. Prereq: 4050, or 4410, or consent of instructor.

5680 Physiology of Development (3) Chemical aspects of growth, cell division, differentiation and function. Prereq: Biochemistry 4110-20. F

5670 Cellular Immunology (4) Laboratory course with emphasis on immunological phenomena at cel-
lular 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.

5760 General Vertebrate Neuroanatomy (3) (Same as Psychology 5761.)
5780 Radiation Physiology (4) Effects of different kinds of radiations on functions of cells, tissues, and organ systems of animals. Recommended prereq: 5610. (Same as Radiation Biology 5780.)
5790 Transport of Ions Across Epithelia (4) Operational principles and methods needed to study electrical and kinetic properties of epithelia and electrically excitable tissues. Quantitative methods of measuring ion fluxes and flux ratios. Prereq: Two upper-division physiology courses, graduate standing, or consent of instructor. Recommended prereq: Chemistry 3810.

5820 Methods of Taxonomy (4) Classification of animals; rules of nomenclature; problems in priority, preparation of keys, descriptions, and figures. Prereq: Consent of instructor. W

5840 Aquatic Insects (4) Taxonomy and biology of aquatic insects, emphasis on immature forms. 2 hrs and 2 labs. Sp

5860 Geographic Distribution of Animals (4) Distribution patterns of vertebrate and invertebrate animals in all major habitats. Prereq: Consent of instructor.

5870 Insect Synecology (4) Ecology of insect communities.

6000 Doctoral Research and Dissertation (3-15) E

6110 Seminar in Cellular Biology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs. Sp

6140 Seminar in Immunobiology (2) Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.

6210 Seminar in Physiology (2) Prereq: Two physiology courses or consent of instructor. May be repeated. Maximum 6 hrs.

6310 Seminar in Cytology (2) Prereq: 4310. May be repeated. Maximum 6 hrs. W

6350 Seminar in Developmental Biology (2) 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.

6610 Seminar in Genetics (2) Prereq: General genetics. May be repeated. Maximum 6 hrs. F

6650 Seminar in Aquatic Biology (2) Prereq: Any 2 of 4200, 4660-70, Botany 3061, 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.)
The College of Nursing offers a five-quarter program of study leading to the Master of Science in Nursing degree. The general purpose of the program is to prepare at the graduate level nurses who are qualified to function as practitioners, clinicians, educators, and administrators in all segments of the health care delivery system.

Upon successful completion of the program, graduates will be able to:
1. Provide advanced high quality, comprehensive nursing care to individuals and groups in a variety of settings;
2. Collaborate with other health professionals in systematic implementation and evaluation of health care delivery to large groups in agency and community settings;
3. Utilize appropriate advanced teaching, administrative and clinical practice skills in the discharge of one's professional responsibilities;
4. Utilize appropriate research findings in the implementation and evaluation of nursing care;
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 demonstrate successful completion of the equivalent of an upper division major in Nursing.
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:
   - Core requirement: 17 hrs
   - Clinical concentration option: 26-30 hrs
   - Functional concentration option: 11 hrs
   - Electives: 5-9 hrs

   Total: 60 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 9 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 care nursing or community mental health nursing as a clinical concentration option. Students selecting the primary care nursing option must complete the following courses: 4770, 5050, 5240, 5260, 5550, 5650. Students selecting the secondary care nursing clinical option must complete the following courses: 5120-30 (or 5140-50), 5310, 5330. Students selecting the community health nursing option must complete the following courses: 5410-20-30-40, 5470, 5510, 5630.
6. The core requirement which must be completed by all students regardless of clinical option includes 5010, 5020, 5030, 5210 and a graduate level statistics course which must be approved in advance by the student's faculty advisor.
7. Students may select a functional concentration option in teaching, management or advanced clinical practice. Students selecting the teaching option must complete 6 hours of graduate level courses in education and 5630. Students selecting the management option must complete 6 hours of graduate level courses in administration and 5730. Students selecting the 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. All courses taken in other colleges must be approved in advance by the student's faculty advisor.

Faculty
Professor: S. E. Hart (Dean), Ph.D. New York.
Associate Professors: M. E. Groer, Ph.D. Illinois; K. J. Kant, Ph.D. Illinois; J. Mailan, Ph.D. Purdue; B. M. Reid, M.S.N. Columbia.
Assistant Professors: K. P. Conlon, M.S.N. New York; (Buffalo); M. M. Fenske, M.N. Florida; M. F. Kollar, M.N. Vanderbilt.

Courses
4240 Nursing in Acute Care Settings (5) Theory and clinical practice related to care of hospitalized children and adults experiencing acute illness episodes. Open only to MSN candidates lacking undergraduate major in nursing; others with consent of instructor. Prereq: All required 2000 and 3000 level nursing courses. 3 hrs and 2 labs. Su
4260 Community Mental Health Nursing (5) Theory and clinical practice related to care of clients whose
primary actual or potential health problems is psychosocial or developmental; strong family and community orientation with emphasis on mental health and mental illness. Open only to MSN candidates lacking undergraduate major in nursing; others with consent of instructor. Prereq: All required 2000 and 3000 level nursing courses and 4240. Correq: 4210. 3 hrs and 2 labs. Sp

4280 Nursing the Child Bearing Family (3) Theory and clinical practice related to care of clients and their families. Emphasis on role of child bearing and child rearing, normal and abnormal states. Open only to MSN candidates lacking undergraduate major in nursing; others with consent of instructor. Prereq: All required 2000 and 3000 level nursing courses. 3 hrs and 2 labs. Sp

4330 Nursing in the Specialties (2-4) Application of principles from behavioral, physical, social and nursing sciences to solution of nursing problems. Exploration of nursing intervention needed to maintain or restore homeostasis in clients experiencing selected physiological and/or behavioral deviations. Specific topics to be determined by faculty and students. Prereq: Consent of instructor. May be repeated with consent of instructor. Maximum 12 hrs.

4350 Oncology Nursing (3) In-depth exploration of the cancer problem, medical and nursing intervention. Relates cellular kinetics to theories of carcinogenesis and metastasis, and examines treatment modalities and nursing intervention employed in management of various forms of cancer. Interdisciplinary approach analysed: Prereq: 4320, R.N. status, or consent of instructor.

4770 Comprehensive Health Assessment (6) Principles and processes involved in health screening of children and adults, including health history, interviewing and physical examination. Prereq: All 3000-level nursing courses or equivalent or consent of instructor. 4 hrs and 2 labs. F, Sp

4810 Management of Patient Care (3) Theories of leadership, management and supervision as applied to professional nursing practice. Open only to MSN candidates lacking undergraduate major in nursing; others with consent of instructor. Prereq: 4240-60, 4810. Sp

4820 Clinical Nursing Practicum and Seminar (6) Intensive clinical laboratory with opportunity to apply nursing and nursing related theories in a variety of health care settings. Weekly seminars with clinical practice. Open only to MSN candidates lacking undergraduate major in nursing; others with consent of instructor. Prereq: 4240-60, 4810. Sp

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise eligible for graduation. A student using such a student plan must have used facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NCR only. E

5100 Applied and Pathophysiology (5) Advanced physiological theories and principles related to normal and abnormal body function with particular emphasis on those processes which, when altered, are most commonly encountered in acute and chronic disease states. Prereq: 3210-20 or 4010 or consent of instructor. 5 hrs and 2 labs. Sp

5200 Current Health Issues (2) Weekly seminar dealing with current and pending legislative, political, and community issues, concerns, and actions that affect health care. Some indirect implications for nursing and health care. E

5300 Behavioral Dynamics (3) Interviewing and communication theories utilized in nurse-client interaction. Observation, interview, conventional and treatment of anxiety, depression, psychosomaticism and crisis status. Prereq: 16 hrs in undergraduate or graduate behavioral sciences. E

5500 Applied Pharmacology (4) Advanced pharmacological concepts applied to clinical situations; in-depth exploration of indications, contraindications, pharmacokinetics, pharmacodynamics, interactions and expected action of selected pharmacological agents. W

5103 Independent Study in Nursing (1-4) In-depth exploration of a nursing topic of special interest to the student. Prereq: Consent of instructor. May be repeated. E

5110 Geriatrics and Gerontology (4) Physiological, psychological, developmental, economic, and sociocultural aspects of aging; health needs of aging people; physical, mental, social, and psychological impact with aging process; management of health care for elderly. Prereq: 5010. 2 hrs and 2 labs.

5120 The Acutely Ill Adult I (6) In-depth exploration of physiological and pathological manifestations encountered in acute illness usually associated with adulthood. Medical and nursing therapeutic modalities will be explored and analysed. Prereq or coreq: 5010. 3 hrs and 3 labs. W

5130 The Acutely Ill Adult II (6) Continuation of 5120 with further exploration and analysis of impact of acute illnesses on adult clients and their families. Prereq: 5010. 3 hrs and 3 labs. Sp

5140 The Acutely Ill Child I (6) In-depth exploration of physiological and pathological manifestations of acute illness in children with special emphasis on developmental implications. Medical and nursing therapeutic modalities. Prereq or coreq: 5010. 3 hrs and 3 labs. W

5150 The Acutely Ill Child II (6) Continuation of 5140 with further exploration and analysis of impact of acute illness on children and their families. Prereq: 5140. 3 hrs and 3 labs. Sp

5170 Readings in Applied Physiology (3) Carefully planned library study of selected topics in physiology and pathophysiology related to various body systems. Prereq: 5010. E

5210 Nursing Research Methods (4) Utilization of research process to identify and solve common nursing problems; data collection and analysis; use of the literature; presentation and publication of findings. Prereq: Graduate level course in behavioral or biomedical statistics. W, Sp

5240 Management of Common Health Problems (5) Indications for treatment and referral, use of protocols and treatment plans; pharmacological agents in common use; intervention in emergencies. Prereq: 5010, 4770. 3 hrs and 2 labs. W

5250 Chronic Health Problems (4) Indentification and in-depth exploration of health problems of long-term or lifelong nature common to people in various age groups over life continuum; nursing and health care management of individuals and groups who must deal with one or more chronic health problems throughout most or all of their lives. Prereq: 5010, 4770, 3 hrs and 2 labs. W

5260 Advanced Family Health Care (4) Nursing and health care management of families in child-bearing and child-rearing stages of development; advanced developmental psychology, dynamics, management of women during pregnancy, labor, delivery, and post parum period, assessment of newborn infants. Prereq: 5010, 4770. 2 hrs and 2 labs. Sp

5310 Secondary Care Nursing Field Work I (9) Advanced clinical practice in acute care hospital settings with opportunities to apply newly acquired nursing knowledge to more complex clinical nursing situations. Prereq: 5120 or 5140. Su

5320 Secondary Care Nursing Field Work II (9) Continuation of 5310 with emphasis on further acquisition and refinement of nursing skills needed to provide high quality nursing care to acutely ill patients. Prereq: 5310. F

5330 Secondary Care Nursing Seminar I (2) Weekly on-campus seminar taken concurrently with 5310; topics focus on discussion of nursing problems commonly encountered in acute care settings. Su

5340 Secondary Care Nursing Seminar II (2) Continuation of 5330 to be taken concurrently with 5330. F

5410 Principles of Community Mental Health I (3) Epidemiology and mental health problems of cultural, religious, and economic variables affecting mental health status of individuals, families, and communities; functional and dysfunctional status of community mental health centers. F

5420 Principles of Community Mental Health II (3) Continuation of 5410 with emphasis on recognized and developing approaches to mental health problems and maintenance of mental health. W

5430 The Adult and Mental Health (3) Coping and adjustment problems commonly experienced from postadolescence through middle adulthood; nursing approaches to alleviation of mental health problems of both institutionalized and noninstitutionalized adults. 2 hrs and 1 lab. W

5440 The Child and Mental Health (3) Normal and abnormal behavioral and psychosocial development from infancy through adolescence; emphasis on primary prevention activities. Treatment systems and modalities in clinical settings. Prereq: 5430. 2 hrs and 1 lab. Sp

5470 Advanced Psychiatric Nursing Skills (3) Group and family process and therapy in primary and secondary levels of mental health. Continued exploration, analysis and application of other therapeutic interventions. Prereq: 5430. 2 hrs and 1 lab.

5510 Community Mental Health Nursing Field Work I (6) Clinical practicum in a community setting providing opportunities to apply mental health nursing knowledge in planned interactions with individuals and groups at primary, secondary and/or tertiary care levels. Community and mental health systems assessment. Prereq: Consent of instructor. May be repeated. E

5520 Community Mental Health Nursing Field Work II (6) Clinical practicum for graduate student choosing functional concentration of advanced clinical practice. Objectives identified by student to meet specific learning and practice needs. Prereq: 5510 and 5530. F

5530 Community Mental Health Nursing Seminar I (3) On-campus seminar taken concurrently with 5510; common nursing and community problems encountered by community mental health nursing field students. Su

5540 Community Mental Health Nursing Seminar II (2) Taken concurrently with 5520; a continuation of 5530. F

5550 Nurse Practitioner Fieldwork I (6) Placement in selected off-campus primary health care delivery site for purposes of applying newly acquired knowledge and developing clinical skills necessary to function as a nurse practitioner. Prereq: 5050, 5240, 5260. Su

5560 Nurse Practitioner Fieldwork II (6) Continuation of 5550 with further emphasis on acquisition of nurse practitioner skills coupled with ability to function autonomously within a defined practice setting. Prereq: 5550.

5580 Nurse Practitioner Seminar I (2) On-campus seminar taken concurrently with 5550; topics focus on common nursing and health problems identified by nurse practitioner field students and on role of nurse practitioner in health care delivery. Su

5580 Nurse Practitioner Seminar II (2) Continuation of 5580 taken concurrently with 5570.

5730 Management Strategies and Practice (5) Application and analysis of curricular and teaching methodologies; field placement with supervised opportunities to provide both classroom and clinical instruction to undergraduate nursing students. Prereq: 6 hrs approved education courses or consent of instructor. 2 hrs and 3 labs. F, Sp

5590 Nurse Practitioner Seminar I (2) Weekly on-campus seminar taken concurrently with 5550; topics focus on common nursing and health problems identified by nurse practitioner field students and on role of nurse practitioner in health care delivery. Su

5590 Nurse Practitioner Seminar II (2) Continuation of 5590 taken concurrently with 5580.

5790 Management Strategies and Practice (5) Analysis and application of managerial and supervisory theories and strategies; field placement in nursing service facility with supervised opportunity for both classroom and clinical instruction to undergraduate nursing students. Prereq: 6 hrs approved management courses or consent of instructor. 2 hrs and 3 labs. F, Sp

5770 Special Topics (3) In-depth study of selected nursing topics, problems, or issues not covered in other courses. Prereq: Consent of instructor. May be repeated. Maximum 6 hrs.
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 independent study. The program encourages students to pursue graduate studies to the limits of their abilities.

The School is not departmentalized, and, apart from certain basic requirements, each student's curriculum is planned to meet individual needs, with the aim of giving: (1) 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, and cellular, developmental and mammalian 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 should 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 Biomedical Sciences Seminar (5350-60-70) for one year.

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

5. 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.

6. Pass both written and oral examinations.

7. A dissertation reporting the results of original and significant scientific research. A minimum of 36 quarter hours of course work is required.

8. A final oral examination on the dissertation.

9. A formal seminar presentation of the dissertation research.

**SPECIAL MASTER OF SCIENCE DEGREE PROGRAM**

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

Requirements for the M.S. degree are:

1. Graduate credit or a proficiency in the following core courses: Biochemistry (5110-20); Cell Biology I (5180); Cell Biology II (5190); plus any three of the following four courses: Biophysics (5140); Genetics (5160); Molecular Genetics (5170); and Mammalian Physiology (5200). Additional credits may be obtained (6 to 15 credit hours) with electives. The student will need previous training in biology, calculus, physics, organic and physical chemistry.

2. Forty-five credit hours of approved graduate courses including a minimum of 9 quarter hours for thesis (maximum 18 quarter hours of credit for course 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:

D. Billen, Ph.D. Tennessee; D. E. Olins, Ph.D. Rockefeller.

Associate Professor:

F. H. Gaertner, Ph.D. Purdue.
substrates, covalent catalysis, general acid-base catalysis, and strain and distortion of substrates. Prereq: 5110-20.

6220 Enzyme Regulation and Kinetics (3) Kinetics of catalysis; inhibition by product, substrate and dead-end inhibitors; stimulation and inhibition of allosteric enzymes; types of feedback regulation; role of subunits in enzyme regulation; multifunctional enzymes. Prereq: 5110-20.

6240 Chemistry and Metabolism of Lipids (3) Nomenclature, chromatographic isolation, chemistry, physical properties, and enzymology of lipids. Hormonal action of prostaglandins and role of lipids in membranes, enzymic expression, and nervous tissue. Lipid biochemistry of mammals; comparative aspects, particularly lipid pathways in bacteria and yeast. Prereq: 5110-20.

6270 Viral Carcinogenesis (3) History of viral oncology and descriptive catalog of tumor viruses. Biology of normal and transformed cells. DNA tumor viruses; replication cycle; transformation; genetics; natural history. RNA tumor viruses; endogenous and exogenous states; genetics; induction; transformation; natural history.


6300 Mutagenesis (3) Basic mechanisms in chemical and radiation mutagenesis and dosimetry in variety of systems including bacteria, fungi, Drosophila, and mice.

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.
Graduate School of Library and Information Science

Ann E. Prentice, Director

MAJOR
Library Science

DEGREE
M.S.L.S.

The Graduate School of Library and Information Science provides a library education program leading to the preparation of librarians for work in all types of libraries. The programs of study of this School include the graduate curriculum leading to the degree of Master of Science in Library Science.

MASTER OF SCIENCE IN LIBRARY SCIENCE

The goal of the program is to prepare graduates to function effectively in libraries and information centers. The program is designed to:

1. Enable students to examine critically the role and function of libraries and information centers in our society, and to define and redefine that role as the needs of society demand;
2. Enable students to understand and use the concepts and procedures related to the selection, acquisition, organization, and dissemination of knowledge;
3. Enable students to understand and apply the principles of management to the library and information center;
4. Enable students to assume individual and collective responsibility for the well-being and development of their profession and of professional service;
5. Enable students to make informed assessments and decisions regarding various career opportunities in libraries and information centers.

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, 21 hours of which form a core curriculum required of all students. Either a thesis or a non-thesis program 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.

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 programs 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 registries 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 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:
E. E. Mauldin, M.S.L.S. Illinois; G. R. Purcell, Ph.D. Case Western Reserve.

Associate Professors:

Assistant Professors:
J. M. Pemberton, Ph.D. Tennessee; G. M. Sinkankas, Ph.D. Pittsburgh.

Courses

4140 Libraries and Librarianship (3) Librarianship as an occupation: its organization, responsibilities, problems and prospects.

4150 School Library Administration (3) Objectives, functions, and place of school library; relationship to local and state services; cooperative planning for quarters and materials; evaluation. (Same as Curriculum and Instruction 4150.)

4270 Organization of Library Collections I (6) Acquisitions, cataloging and maintenance of library collections.

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) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only. E
5110-20-30 Problems in Library Science (3, 3, 3) May be repeated with consent of school.

5140 Research Methods in Library Science (3) Recent methods of research and techniques of 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 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.

5220 Sources and Services for the Social Sciences (3) English and non-English literature and bibliographical sources in economics, political science, history, psychology, and sociology; organization of collections for optimum use. Prereq: 5200.

5230 Sources and Services for the Natural Sciences (3) Organization concepts applicable to libraries and librarians. Prereq: 4270.

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.


5260 Government Publications II (3) Acquisition, organization and utilization of publications of foreign governments and international organizations such as United Nations, UNESCO, and others.

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 Systems and 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.

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 problems, acquisition, organization, and use of information.

5370 The Library in the Community (3) Public library as social agency; 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, inter-relationship of staff, materials, and user space requirements.


5510 Multimedia Resources of Libraries (3) Selection, acquisition, processing, storing, and servicing nonbook materials, with special attention to films, recordings, microforms, photo-copying.

5520 History of Books and Printing (3) Development of alphabet and writing; early writing materials; book in manuscript; history and technique of printing; book illustration and binding; standards of modern fine printing.

5530 Contemporary Publishing (3) Creation, production, marketing, and distribution of materials acquired by libraries, with special attention to various types of publishers.

5540 Special Collections—Archives and Rare Books (3) Problems involved in acquisition, organization, housing, preservation and utilization of rare books and archival materials.

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 1920.

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) Analysis of application of data processing methods to basic library operations such as bibliographic control, technical processes, circulation control, and management functions.

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) Elements in design and operation of information retrieval systems, including acquisition, indexing vocabularies, information representation, file organization, search procedures, and system evaluation.

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.

5999 Practicum (6 or 9 or 12) Opportunity to translate library theory into practice under guidance of qualified librarians. Prereq: Completion of 21-hr core curriculum plus approval of director.
The Graduate School of Planning offers a two-year graduate course leading to a degree of Master of Science in Planning with concentrations in land use, transportation, environmental, regional, administrative, health, and historic preservation planning.

The purpose of study is the education of professional planners, competent to handle positions of increasing technical and administrative responsibility. Graduates are candidates for professional service in regional, city, county, and metropolitan area planning agencies; in local, state, and federal agencies concerned with physical, economic and administrative planning; in private businesses and organizations dealing with urban problems; and in private consulting practices.

The curriculum is organized on a basis of six quarters, or 72 credit hours, and provides the student with core courses in planning theory, methods and techniques, and also takes advantage of offerings at The University of Tennessee in related fields such as government, economics, geography, civil engineering, and sociology.

The course of study ordinarily requires two years with an optional work internship during the summer between the two years. Planning courses as well as related courses will be offered during the summer period. This is to serve the needs of those planners now in the field who wish to acquire their professional degree but who can spare only the minimum amount of time from their jobs because of financial or family considerations.

Entering students follow a program of courses which provides education in the basic elements of planning. These include studies in theory, history, analytical methods, and legislation, as well as related courses in government, geography, sociology, and economics. Students are permitted to pursue particular interests through the choice of electives approved by the Graduate School of Planning. Practice in research and analysis on a particular planning problem or topic is obtained through the preparation of a thesis or major study option.

Core planning courses are taught by the faculty of the Graduate School of Planning. Related courses are taught by other specialists drawn from the University faculty. In addition, the services of experienced professional planners in TVA and other public and private organizations are called upon to broaden the scope of the students' understanding. A variety of outside speakers and seminar leaders provide insight into particular problems of significance to planners.

ADMISSION PROCEDURES

All applicants should submit two letters of recommendation with their applications. Both letters should be from teachers familiar with the applicant's undergraduate or, where applicable, graduate academic record. In the event the applicant has had planning experience, a third letter is required from a supervisor or other person familiar with the planning work of the applicant. All applicants who wish to be considered for financial assistance from the University or the Graduate School of Planning should also submit recent Graduate Record Examination scores for the Aptitude (verbal, quantitative and analytical) portion of that test. All applicants are also requested to submit a statement of career goals. All inquiries concerning admission should be addressed to: Director, Graduate School of Planning, The University of Tennessee, Knoxville, Tennessee 37916

DEGREE REQUIREMENTS

Each student will be required to complete a minimum of 72 hours credit. The following courses are the required core curriculum for the M.S.P. degree: 5040, 5045, 5100, 5110, 5130, 5190, 5230, 5270, 5290, 5340, 5435, 5440, 5465, 5500, Sociology 5320 or Statistics 5211. Waivers can be made by the faculty where competence is demonstrated. Each student will be required to demonstrate competence in individual research. This may take either of two forms.

Plan I—Complete a thesis for 9 hours credit.

Plan II—Complete a major study with acceptable documentation. In order to be eligible for the major study the student must have earned a grade of B+ or higher in Research Methods II, have a 3.5 cumulative grade point at the time of approval of the major study proposal, and have completed at least 24 hours of graduate study. The student meeting these criteria may present a proposal for a major study which will include at least 9 hours of elective course work in an area of concentration. The proposal shall justify the area of study, the approach to the study, and the method of final documentation. Approval of the documentation, which must include written documentation, is a prerequisite for graduation.

Students in the Graduate School of Planning are given a comprehensive written examination after approximately four quarters of course work. In addition to testing the knowledge of the student, the information thus obtained is taken into account in advising students concerning the study program they should undertake during the balance of their academic program to remove any indicated deficiencies. Each student will be encouraged, but not required, to complete a work internship equivalent to at least two and one-half months of full-time work in a planning agency at approximately the mid-point in course work.

Faculty

Professors:


Associate Professors:

G. E. Bowen, M.A. George Washington; J. A. Spencer, M.C.P. Ohio State.

Assistant Professors:

E. Cole, M.S.P. Tennessee; P. Fisher, M.S. Florida State; M. Kersey, B.L.A. Georgia; J. G. Stiloff, M.U.P. Hunter.

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. State of the art, the process, the comprehen-
sive plan, implementation devices. Planning issues in society. Not for credit for M.S.P. degree. F

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15) Required for the non-thesis student not otherwise 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. SNC 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, audiovisual equipment. F, Su

5045 Communications for Planners II (1) Graphic communications in planning. Maps and mapping, computer graphics, models and presentation graphics. Prereq: 5040. W

5050 Communication for Planners III (1) Audiovisual equipment, programmed communications, and photography used in planning. Prereq: 5045. Sp

5100 Theory of Planning (3) Analysis of nature and objectives of planning process; role of planner in planning function in public decision-making. Prereq: 5110. W

5110 Introduction to Planning (3) History of planning, familiarization with operations of contemporary planning, concept of systems, current trends and issues. Relationship between planning and society in which it occurs. Designed for GSP students. F, Su

5130 Planning Research Methods I (2) Research techniques in subject areas associated with city and regional planning. Research tools, data collection and analysis as basis for planning and decision-making. (Same as Water Resources Development 5130.) F, Su

5135 Planning Research Methods II (3) Application of rigorous investigative techniques in solving planning problems, including statistical analysis and mathematical models. Urban and regional information systems as resource and tool in problem identification and solution. Prereq: 5130. W, Sp

5145 Library Research for Planning (1) Survey of publications of interest to planners, including resources and research techniques. Use of facilities and collections of UTK library. F, W

5160 Planning and Utilities (3) (Same as Environmental Engineering 5160 and Water Resources Development 5160.)

5170 Planning for Historic Preservation (3) Planning for preservation, restoration and conservation of historic buildings, areas and sites as related to comprehensive planning process. National, state, and local government role in preservation, designation of sites, legislative needs, financing and administrative organizations.

5180 Planning Analysis and Forecasting (3) Methods of quantitative analysis and modeling in urban and regional studies. Population, employment, and economic base studies with emphasis on forecasting techniques. Prereq: 5130. W

5230 Urban and Site Design (3) Principles of design of residential subdivisions and some components of commercial development as shopping centers, institutional complexes, central business districts. Problems of reviewing alternative designs against each other or written regulations. Extensive laboratory experience. E

5235 Urban and Site Design II (3-6) Prereq: 5230.

5270 Planning and Transportation (3) (Same as Civil Engineering 5270.) W

5280 Planning Methods (5) Tooling up studies; methods for organization of land use and public facilities and 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: 5100.

5310 State Planning (3) Evolution of planning function in state government, with emphasis on institutional environment in which planning occurs. Context and scope of state planning, and relationships with other branches and levels of government. Prereq: 5100.

5340 Implementation (3) Policy formulation, information systems, taxation, capital improvement programming, and other aspects of plan implementation. Programming public actions to affect development. Prereq: 5440. Su, F

5360 New Towns (2) Historical development of planned new towns and implications for national urbanization policy in United States; process by which new towns are created, from establishment of objectives to administration of development process and provision of public services; organizational alternatives for new town planning, development and management in context of past experience and future objectives. Prereq: 5110 and consent of instructor.

5380 Housing (3) Nature and demand for housing in U.S. and abroad with emphasis on U.S. experience. Private market processes and public influence. Problems of change in housing supply, impact of new technology, and governmental programs to improve supply and quality of housing. Coreq: 5110 or consent of instructor.

5390 Futures (3) Alternative futures and their implications for future living patterns and community planning. Techniques of futures research.

5410-20 Special Topics in Planning (1-3, 1-3, 1-3) Lecture, group discussion, and individual research and study on specialized topics in planning not covered in depth in other courses. May be repeated. Prereq: Consent of instructor. E

5435 Planning and Government (3) Governmental context within which planning occurs. Policy making as public process. Planning structures, powers, and policies. F


5455 Urban Revitalization (3) Goals, principles and strategies for restoring and revitalizing cities. Review and analysis of historic, current, and proposed public and private programs aimed at urban revitalization. Physical building and restoration activities as related to financial and administrative requirements. Relationship between construction-oriented activities and economic and social development programs is emphasized. Prereq: 5110 or consent of instructor.

5460 Planning Administration (2) Planning agency management, program development, and agency finance. Prereq: 5435.

5465 Planning and Property Development (3) Process of urban physical growth and change with emphasis on functioning of private sector real estate development and its relationship to planning. Partnership roles of public and private sectors in urban development and redevelopment. Prereq: 5440.

5500 Synthesis (6) Problem-oriented experience to integrate knowledge from previous courses. Interrelationships stressed; student required to use judgment in evaluation and creation of plans and policies addressed to real world situations. Extensive laboratory experience. Prereq: Required planning courses or consent of faculty. F, W

5670 Social Planning (3) Theory, philosophy and implications of programs for planned social change. Consideration of major social planning issues in diverse fields of service; aging, corrections, education, health, social services. Prereq: Consent of instructor. (Same as Social Work 5670.)
Graduate School of Social Work

Ben P. Granger, Dean
Betty J. Cleckley, Associate Dean
Ronald K. Green, Director, Continuing
Social Work Education
David P. Fauri, Director, Nashville Branch
Roger M. Nooe, Director, Knoxville
Branch
Kate Mullins, Director, Memphis Branch

MAJOR Social Work DEGREE M.S.S.W.

The University of Tennessee School of Social Work is a fully accredited two-year graduate professional school, with a program (thesis or non-thesis option) leading to the degree of Master of Science in Social Work. The full two-year curriculum is offered in all three branch locations.

GRADUATE PROFESSIONAL EDUCATION

The School of Social Work has as its primary objective the education and training of persons for leadership in the social welfare profession and the social work practice community. Leadership roles include positions in social welfare administration, social planning and policy development, and positions as treatment team leaders, supervisors, consultants, and expert practitioners.

Central to professional leadership are a commitment to the values and goals of the profession and a developed capacity for self-awareness and self-discipline. The experience of a graduate professional education builds commitment, and the School's program guides students into independent, analytical thought and prepares them to use their skills and knowledge to effective purpose.

The School of Social Work recognizes and enjoys the challenge of cultural pluralism in society and encourages applications for admission from minority group members. Through the planned inclusion of significant and pertinent racial and ethnic content in the curriculum, the School provides students with the educational background needed to take creative roles in the social work profession's efforts toward the elimination of racism and such other social ills as poverty, crime, neglect, and social injustice.

A special bulletin describing the facilities, admission, fees, and degree requirements is obtainable from The School of Social Work, 2041 Lake Avenue, Knoxville, Tennessee 37916.

AREAS OF PROFESSIONAL PRACTICE

Specializations within the School's curriculum prepare students for social work careers in such practice fields as criminal and juvenile justice systems; family and child welfare services in public and voluntary agencies; group services in neighborhood and community centers; health services; mental retardation; public welfare services; mental health services; manpower training programs; governmental and voluntary human services planning agencies; rehabilitation services; school social work; and social gerontology.

THE PROFESSIONAL CURRICULUM

The School of Social Work's curriculum is designed to provide the student with the basic components of professional competence through a progression of course work and supervised practice experience. Students may elect a thesis or non-thesis option. The two-year, six-quarter program includes a core curriculum, a specialization in one of two areas—social work treatment or social welfare administration and planning—and concurrent field practice.

The Core Curriculum

The core curriculum is offered during the first two quarters of the first year and is required of all students. It is a 30-quarter-hour sequence of five basic courses. As the initial phase of the School's educational program, the core curriculum contributes to the process of socialization and professional identification, and presents students with a comprehensive and broad knowledge base from which to operate in the future as practitioners and administrators.

<table>
<thead>
<tr>
<th>Fall Quarter, First Year</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>5070 Social Work Research I</td>
<td>3</td>
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<tr>
<td>5110 Social Welfare Policy and Services I</td>
<td>3</td>
</tr>
<tr>
<td>5210 Human Behavior and Social Environment I</td>
<td>3</td>
</tr>
<tr>
<td>5410 Social Work Practice I</td>
<td>3</td>
</tr>
<tr>
<td>5910 Field Practice</td>
<td>3</td>
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<tr>
<td>TOTAL QUARTER HOURS</td>
<td>15</td>
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<tr>
<th>Winter Quarter, First Year</th>
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<tbody>
<tr>
<td>5080 Social Work Research II</td>
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<tr>
<td>5120 Social Welfare Policy and Services II</td>
</tr>
<tr>
<td>5220 Human Behavior and Social Environment II</td>
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<td>5420 Social Work Practice II</td>
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<tr>
<td>5920 Field Practice</td>
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<td>TOTAL QUARTER HOURS</td>
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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

| Specialization Courses and Electives | 10 |
| TOTAL QUARTER HOURS | 14 |

<table>
<thead>
<tr>
<th>Fall Quarter, Second Year</th>
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<tbody>
<tr>
<td>5930 Field Practice</td>
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<tr>
<td>Specialization Courses and Electives</td>
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<td>TOTAL QUARTER HOURS</td>
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<tr>
<th>Winter Quarter, Second Year</th>
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<tbody>
<tr>
<td>5940 Field Practice</td>
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<tr>
<td>Specialization Courses or Electives</td>
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<td>TOTAL QUARTER HOURS</td>
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<thead>
<tr>
<th>Spring Quarter, Second Year</th>
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<tbody>
<tr>
<td>5950 Field Practice</td>
</tr>
<tr>
<td>5961 Integrative Seminar</td>
</tr>
<tr>
<td>One Elective</td>
</tr>
<tr>
<td>TOTAL QUARTER HOURS</td>
</tr>
</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 based on the experiences of individuals, families, and group methods applicable in the treatment of diverse client problems.

Social Welfare Administration and Planning

Social welfare administration and planning deals with the design, implementation, and continued operation of effective programs for client service. Specifically, the method deals with assessment of client characteristics, development of environmental resources, design of effective organizational structures, management, staff development, program evaluation, social planning, neighborhood and community development, financing, and coordination of services.

Field Practice

Field practice is a critical component of the student's first- and second-year program. Because the School of Social Work cooperates with a wide range of social agencies and human service programs in the principal cities in Tennessee and areas immediately adjacent to the State, the School is able to provide field placements in a variety of social work practices areas. The faculty works closely with the placement agency and the field instructor to assure that the student has a quality field practice experience which meets the objectives of the core curriculum and the specialization.

The first year curriculum is on a concurrent class and field plan, with students engaged in classroom study two or three days per week and in field practice the remainder of the week. First-year agency placements are selected to provide the student with practice experiences related to the core curriculum content and beginning specialization. Within the placement, each student's experiences are planned and designed according to the educational needs.

In the second year, students are engaged full time in classroom courses during the fall quarter. The winter and spring quarter plans consists of a block field placement of four days per week and at least one concurrent classroom course each quarter. Second-year placements are selected according to the student's area of specialization, individual career and educational needs. The student actively participates with the field practice coordinator and the specialization committee in selection of the second-year placement. The second-year field practice experience focuses on the integration of social work knowledge and values, and emphasizes the acquisition and development of full practice skills.

Students are responsible for meeting the requirements of their placement agencies in terms of office hours and workload coverage. This responsibility takes precedence over scheduled University breaks and may result in variations in holidays and office hours for the student.

DEGREE REQUIREMENTS

1. Satisfactory completion of the curriculum.
2. All courses taken as part of the degree programs, whether taken within the School of Social Work or outside, must be acceptable for graduate credit, relevant to social work and to the student's career objectives, and have the approval of the student's faculty advisor.
3. Achievement of a B average on all work presented for the Master's degree.
4. Completion of each required course at a satisfactory level (a grade of C or above). Graduate courses may not be repeated to raise a grade. 
5. Students who elect a thesis must pass an oral examination conducted by a faculty committee.
6. Students who elect a non-thesis option must pass a written comprehensive examination.
7. Credits to be counted toward the degree must be earned within six years from the beginning date of the earliest course applied toward the degree, except in cases where permission to update courses has been granted.
8. The minimum number of credit hours required for a degree shall be 79 hours including a maximum of 36 S/NC hours.
9. Performance at a satisfactory level in field 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. Those with other academic backgrounds may request consultation regarding ways in which they might be admitted.
2. A grade point average of 2.5 on a 4.0 scale, with those falling below the average to be admitted on supplemental evidence of ability to perform at a satisfactory level.
3. Personal qualifications acceptable for entrance into the professional practice of social work.
4. Preference is given to applicants with a B average in undergraduate work and substantial preparation in the social sciences. Applications should be filed not later than December 31 for the following fall quarter. Applications should be filed not 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 East Lake Avenue, Knoxville, TN 37916, telephone (615) 974-3175. Beginning students are admitted only in the fall quarter. The Admissions Office begins processing applications after October 1 for the following fall quarter. Applications for first-year admission should be filed as early as possible. A 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, 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 Office, 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 Office immediately after filing the Graduate School Application.

The completed University of Tennessee School of Social Work Application for Admission to the School must 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 will be made concerning time and place. Applicants who wish to may also request a personal interview with a faculty member.

ACCELERATED PROGRAM

The University of Tennessee School of Social Work has a special accelerated program which enables eligible 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 maintained a 3.0 or above grade point average (on a 4.0 scale) in undergraduate work.
2. Have an undergraduate major in social work which included a supervised field practice component, or have two years full-time practice in the field of social work.
3. Pass a qualifying examination administered by the School of Social Work faculty in early spring.

The accelerated programs begin either in the Memphis Branch in March or in the Nashville Branch in June with an intensive ten-week term from which students proceed in the fall into the regular second-year curriculum. Application for admission to the accelerated program is through the regular admission process. Applications should be filed not later than December 31 for the Memphis program and not later than January 31 for the Nashville program.

PART-TIME STUDENTS

Courses in the regular curriculum of the School are open to persons who meet the admission requirements for full-time study and who are planning to complete the work for the degree within the next two or three years. Application should be made to the School in the regular way, but the applicant should inform the Director of Admissions of the wish to begin part-time study on a planned basis.

TRANSFER CREDITS

Courses completed in another accredited school of social work are usually accepted for credit. Application for transfer credit is made at the University of Tennessee School of Social Work degree requirement providing the applicant meets the admission requirements of the Graduate School and The University of Tennessee School of Social Work. If previous coursework is equivalent to required or elective courses offered here, The University of Tennessee School of Social Work allows a maximum of 45 credit hours of graduate course work from another accredited institution to be transferred into the student's Master's program. Such work
must have been taken for graduate resident credit and passed with a B or better. In addition, it must be part of an otherwise satisfactory graduate program (B average) and be approved by the branch director and the Graduate School. This work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

Social work 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


Courses

5000 Thesis (1-15) E

5002 Non-Thesis Graduation Completion (3-15)

Required for the non-thesis student not otherwise registered during any quarter when such a student uses university facilities and/or faculty time before degree is completed. May not be used toward degree requirements. May be repeated. S/NC only, E

5670 Social Work Research I (3) Research methodology as applied to principles and methods of social work program. Prereq: completion of research design, instrument construction, data collection, analysis, and presentation; and report writing.

5683 Directed Readings in Research (2-4) May be repeated with approval of instructor. Maximum 4 hrs. F, W, Sp

5900 Special Problems in Social Work (2-9) Individual study and research on problems of special significance to the student's program, under supervision of major professor. May be repeated. F, W, Sp

5110 Social Welfare Policy and Services I (3) Interdisciplinary approach to social welfare problems and contemporary social policy at local, state, national, and international levels of organization. Prereq: completion of core resident credit and be approved by the branch director and the Graduate School. This work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

5101 Social Welfare Policy and Services II (3) Examines selected social welfare policies and programs in terms of essential functions, structures, roles and processes. Prereq: completion of core resident credit and be approved by the branch director and the Graduate School. This work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

5120 Social Welfare Policy and Services III (3) Examines selected social welfare policies and programs in terms of essential functions, structures, roles and processes. Prereq: completion of core resident credit and be approved by the branch director and the Graduate School. This work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

5130 Social Policy Analysis (2-3) "Policy science" techniques are considered for appropriateness in assessing social, psychological, and political implications of social policy proposals. Prereq: Completion of core or consent of instructor.

5161 Social Welfare Seminar (2-3) Problem area or field of practice seminar focusing on substantive knowledge about social policy or condition and individual methods, techniques of research, policy analysis, social policy, social welfare policy, and social work practice. Prereq: completion of core resident credit and be approved by the branch director and the Graduate School. This work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

5210-20 Human Behavior and Social Environment I and II (3) Examination of theories pertaining to individual, family, and small group within context of functions, structures, roles and processes. Behavior of these systems conceptualized along functional-dysfunctional and normal-deviant dimensions. Organizing theories, development and maturation, adaptive and defensive mechanisms, Open system approach used to understand interpersonal relationships. Psychological, biological, and social variables with emphasis on implications of culture and ethnicity.

5260 Special Accelerated Program in Social Work I (2-3) Ten-week intensive program for students with intensive academic and field practice experience that qualifies them to enter second year of graduate study or complete successful completion of this term. S/NC only.

5310 Human Behavior and Social Environment (2-3) Social work practice with interdependent and interrelated factors. Proper use of assessment and treatment applied to practice with individuals in crisis. Prereq: Completion of core or consent of instructor.

5311 Imaginative Perspectives on the Human Condition (2-3) Examination of usefulness of social work students of prose, drama, and poetry, which illumine new understandings and give insight into everyday life situations and events, portrayed by creative writers. Experiential and personal response to poetry. Prereq: Completion of core or consent of instructor.

5312 Psychopathology and Social Deviance (2-3) Theories and research in etiology of mental disorders and personality disorders. Prereq: completion of core or consent of instructor.

5314 Comparative Theories of Personality (2-3) Those personality theories with most relevance for social work practice with individuals, groups, or families.

5315 Human Sexual Problems (2-3) Techniques and techniques in assessment of personal and social attitudes toward sexual behavior, clinical problems and approaches to make social workers better able to deal with clients with sexual problems. Prereq: Completion of core or consent of instructor.

5316 Mental Health and Employment (2-3) Work as major life task and value, attitudes toward work, matching job to individual, using mental health and social work skills to use rational analysis as treatment modality. Prereq: Completion of core or consent of instructor.

5400 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.

5402 Social Work Practice II (3) Assessment, planning, methodology and skills development fundamental to social work practice. Combines classroom skills and laboratory experiences.

5403 Seminar on Behavior Therapy (3) Behavior modification methodology applied to clinical assessment, choice of designs to assess treatment interventions, skill in evaluating data on effectiveness of treatment interventions. Prereq: Completion of core or consent of instructor.

5442 Short-term Treatment (3-3) Therapy and practice of short-term treatment focusing on nature of methods, characteristics of clients responsive to this approach, and designs of programs providing short-term treatment services. Specific techniques of assessment and treatment applied to practice with individuals in crisis. Prereq: Completion of core or consent of instructor.

5443 Seminar on Behavior Therapy (3-3) Behavior modification methodology applied to clinical assessment, choice of designs to assess treatment interventions, skill in evaluating data on effectiveness of treatment interventions. Prereq: Completion of core or consent of instructor.

5480 Special Topics in Social Work Treatment (2-3) Treatment with individuals, families, and small groups. Prereq: Completion of core or consent of instructor. May be repeated. Maximum 9 hrs. F, W, Sp.

5484 Social Work Practice with the Poor (2-3) Problems, issues, and dilemmas of practice in social services for poor and treatment strategies. Prereq: completion of core resident credit and be approved by the branch director and the Graduate School. This work must be completed within the six-year period prior to the receipt of the degree. In addition, S/NC credit earned for the field practicum is also accepted.

5560 Social Work Treatment with Groups (3) Social work literature, social casework with poor and attributes of service-delivery systems which make that practice possible. Prereq: Completion of core or consent of instructor.

5730 Contemporary Treatment Modalities: Individual and Group (3) Well-established and developing treatment modalities in terms of essential concepts. Differential facets and theory-based linkages. Prereq: Completion of core or consent of instructor.

5802 Practicum in Social Work Research (3) Supervised practice in application of research methodology and tools to social welfare program. Prereq: 5070-80 and consent of faculty member conducting investigation, S/NC only.

5851 Interpersonal Skill Development (2-3) Training group employed to enhance interpersonal-
petence in application of human relations skills in social work practice. Prereq: Completion of core or consent of instructor.

5570 Comparative Methods of Group Treatment (2-3) Comparative analysis and critical review of theory and methodology of some of major group treatment modalities and assessments. Development of social work generalist concept and occupational function in rural areas. Prereq: Completion of core or consent of instructor.

5601 Social Work in Rural Communities (2-3) Characteristics of rural populations and rural community analysis. Outline and analysis of rural social service delivery systems. Development of social work generalist concept and occupational function in rural areas. Prereq: Completion of core or consent of instructor.

5651 Community Organization (2-3) Using behavioral and social science knowledge about communities and organizations to assist in development of resources to meet human needs. Prereq: Completion of core or consent of instructor.

5670 Social Planning (3) Same as Planning 5670. F

5701 Planning and Management of Change in Social Welfare (2-3) Theories and models of change. Prerequisites: completion of core or consent of instructor.

5721 Social Work Administration and Planning (2-3) To assist students in acquiring specific administrative and planning techniques appropriate for social welfare delivery systems. Prereq: Completion of core or consent of instructor.

5761 Social Work Administration and Planning (3) To assist students in acquiring specific administrative and planning techniques appropriate for social welfare delivery systems. Prereq: Completion of core or consent of instructor.

5771 Information Systems and Decision Making (2-3) Decision making in human services organizations. Prerequisites: completion of core or consent of instructor.

5772 Financial Management for Social Welfare Administration (2-3) Centralized decision making related to allocation of scarce resources in social services organizations. Technical aids to budgetary choice and other aspects of financial management examined for utility, parsimony, and feasibility. Prereq: Completion of core or consent of instructor.

5800 Management of Residential Settings (2-3) Issues and trends in management and programming in residential institutions for children, aged, mentally retarded, juvenile and adult offenders, and other groups. Prereq: Completion of core or consent of instructor.

5812 Organizational Perspectives in Juvenile Justice (2-3) Aspects of juvenile justice system: overview of juvenile delinquency, introduction to theories of causation, role of police in detecting delinquency and apprehension of delinquents, juvenile court, police procedures, role of juvenile court, alternatives to institutions, constitutional institutions, aftercare programs, and preventive strategies. Prereq: Second-year standing.

5820 Social Aspects of Illness (2-3) Social, economic, and emotional problems arising from or related to illness and disability as they affect individual, family, and community. Services needed to obtain optimum results from medical care. Lectures, discussion, illustrative case material. Sp

5825 Drugs: Use and Abuse (2-3) Survey and analysis of social, cultural, medical, and psychological factors underlying alcoholism and drug abuse. Recent research and treatment innovations, social work with user and family. Prereq: Completion of core or consent of instructor.

5826 Social Work Treatment for Marital Adjustment (2-3) Theories regarding social and cultural values and implications for policy decisions. S/NC only.

5830 Law and Social Work (2-3) Basic principles of law which relate to social work practice. Organization of courts; legal aid societies; and other problems of legal nature that affect social work. Sp

5860 Social Gerontology (2-3) Physical, psychological, and social aspects of aging; economic and health status of aging; older person and family, community programs for aging; retirement—phenomenon of modern society. Sp

5865 The Roles of Women (2-3) The social roles of women in marriage, concepts regarding contemporary marriage, career patterns, family roles, women's movement, and the effects of social roles and expectations on women's development and education. Prereq: Completion of consent of instructor.

5910-20 Field Practice (3, 4) Instruction and supervised practice in social work with individuals, groups and communities. Prereq: Admission to the School. May be taken in sequence. S/NC only.